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THE PRESIDENT'S PAGE

This letter is devoted to the memory of Dr. Lynds Jones, whose recent death may fairly be said to mark the end of an era in Wilson Club affairs. During the early and formative years of the organization, Lynds Jones, in a very real sense, *was* the Club. With his passing, we have with us only one remaining founding member, Dr. R. M. Strong, of Chicago.

When the Wilson Club was organized in 1888, Lynds Jones became its first Secretary and its first Editor. He served as President of the organization from 1890 to 1893, from 1902 to 1908, and from 1927 to 1929. As Editor of *The Wilson Bulletin*, his tenure included the years 1888–1900, and 1902–1924, a total of thirty-four years of the Club's existence.

Long associated with Oberlin College, an institution which dared depart from accepted academic traditions, Dr. Jones was himself a pioneer and an innovator in bird study. He saw the field of ornithology as embracing more than taxonomy and physiology. Early issues of the *Bulletin* carried at their masthead "A Quarterly Magazine Devoted to the Study of Living Birds." In its pages vernacular names were used, since the Editor wished to appeal to a wider audience than the small coterie of scientists who were at ease in scientific nomenclature. Almost every early issue carried life history studies, and there were constant editorial urgings that bird students apply some quantitative methods to their observations.

Scientific bird study, around the turn of the century, was, to a remarkable degree, restricted to the Eastern Seaboard and the Pacific Coast. Students from eastern centers visited and collected in the midlands of the United States, but resident observers in the Mississippi Valley were few and far between. Along with such pioneers as Thomas S. Roberts, Francis Hobart Herrick, and Norman A. Wood, Lynds Jones did much to make the Midwest *terra cognita* in ornithology. With these men and such others as S. Prentiss Baldwin and V. E. Shelford, Dr. Jones led students into the pathways of ecology. As a result of this wise guidance, the mid-continent region has become a center for sound and productive ecological work.

I shall not forget my first Wilson Club meeting. Like many another neophyte, I went to Cleveland not knowing a single person at the meeting. Through a process of mental agonizing, I had screwed up my courage to present a paper, a superficial (and generally worthless) study of Bachman's Sparrow. It set no rivers ablaze, but Lynds Jones was President, and, with innate courtesy, he spoke kindly to me. Had that word of encouragement not been given, I should probably not have attended another meeting. In this kindly attitude toward the beginner a pattern was established, and the Club is still striving to follow it.

When the Club's membership roll was published in 1902, fourteen years after organization, it contained the names of sixty active members, four honorary members, and fourteen associates. Nevertheless, the foundation was sound. The Club has grown through its devotion to accurate and painstaking study of living birds under natural conditions. May we as present members recall the debt we owe to Dr. Lynds Jones, who charted so wise a course for us!

MAURICE BROOKS

MEXICAN RUFESCENT TINAMOU

(*Crypturellus cinnamomeus mexicanus*)

Adult female, life-size, sketched March 4, 1938, along the Río Sabinas, near the hill village of Gomez Farias in southwestern Tamaulipas, México, by George Miksch Sutton. This is the first of a series of eight color plates honoring the memory of Dr. David Clark Hilton.

THE RUFESCENT TINAMOU

BY GEORGE MIKSCH SUTTON

THE Rufescent Tinamou (*Crypturellus cinnamomeus*) is the most northern of the tinamous. Friedmann, Griscom and Moore, in their useful 'Distributional Check-List of the Birds of México,' inform us that in western México it ranges northward to central Sinaloa, "breeding up to 3000 feet." In the east it is common locally northward to the Río Sabinas, in southwestern Tamaulipas. I have heard it also in the valley below the Mesa de Llera, not far south of Victoria; and Irby Davis has recorded it in eastern Nuevo León, in the hills south of Linares.

In southern Tamaulipas it is especially common in the all but impenetrable, waist-high thicket of wild pineapple (*Bromelia pinguin*). Here its whistle, a mellow, slightly quavering *who-ee-you*, is to be heard all day in spring. Here it passes its whole life, hidden from the outer world, rarely flying, rarely even having occasion, it would seem, to cross a trail. I wonder if there is a more strictly sedentary bird anywhere. Only twice, during the course of several expeditions to México, have I seen a Rufescent Tinamou in full flight. On each occasion the bird acted as if it had never flown before.

I saw my first Rufescent Tinamou in the early spring of 1938. That year Thomas D. Burleigh, the late John B. Semple and I spent several days along the Río Sabinas, seeing for the first time many tropical birds with which we were to become familiar later. I recall how puzzled we were when the Mexicans told us that these whistling birds we were hearing in the flood-plain about us were *perdiz*. Translating the word as *partridges*, we were at a loss to figure out what sort of galliform birds they might be. Semple finally secured a specimen —a badly mutilated one with only a little of the bill left. Our mingled joy and regret can be imagined—joy at examining in the flesh our first crypturiform bird, regret at realizing how useless it would be as a model for the portrait I wanted so much to draw!

Finally, after devoting virtually a full day to the project, I got a tinamou. I never shall forget the peculiar thrill I had in seeing that beautiful specimen lying beside the trail. The sun had disappeared back of the mountain long since, so evening was descending, but I could see, even in the dim light, how pale the large eyes were; and I was much impressed by the coral-redness and peculiar, almost waxy smoothness of the feet. My watercolor drawing I made the following morning, several hours after the bird's death.

We did not find the nest of the *perdiz* in 1938; but on May 2, 1939, in dry,

scrubby woods a few miles north of Valles, San Luis Potosí, I stumbled upon a nest and two eggs under a dead palmetto fan in a tangle of shrubbery and cat's claw smilax. The bird scuttled off, running this way and that with wings spread and drooping, head lowered, and bill parted. It gave low, breathy squeals, which at first I did not recognize as coming from the bird. On preparing the specimen later I was surprised to find it a male, with greatly enlarged testes. The eggs were lustrous but not highly glossed, and of a faintly purplish pale tan color. A nest found by a Mexican friend along the Sabinas about April 20, 1941, held three eggs. We were told that the clutch was never larger than that. I have never seen a downy chick.

The Rufescent Tinamou's whistle can be imitated easily, and it is possible to station one's self in the thicket and whistle the bird up. In the spring of 1941 Dwain W. Warner whistled one up to within a few feet, struck a fence wire with his gun to see what the bird would do, and was surprised to see it crouch with wings spread. When he struck the wire again it whirred noisily up and straight off (1942. *Auk*, 59: 7). Straight flight may not be intentional; it may be the only flight of which the bird is capable. The tail is so very short that it probably does not serve as a rudder.

In 1947 Ernest P. Edwards whistled a bird up and took wonderful motion pictures of it as it ran through the tangle.

It is hard to believe, as one drives southward along the main Laredo to Mexico City highway that there are tinamous within hearing distance of kilometer mark 619—but there they are; and there they will continue to be as long as the thicket remains. If the thickets go, the tinamous will go with them.

University of Michigan Museum of Zoology, Ann Arbor

THE NORTHERN ELEMENT IN THE SUMMER BIRD LIFE OF SOUTH-CENTRAL NEW ENGLAND

BY WENDELL TABER

FROM the White Mountains in New Hampshire a broad, high plateau extends southerly through that state, then across Massachusetts and Connecticut toward Long Island Sound. On a line extended southerly from Mt. Moosilauke (a peak of 4810 feet elevation some 31 miles southwest by west of Mt. Washington) 15 or more peaks in New Hampshire attain altitudes of between 2000 and 3300 feet. Other peaks lie to the east. On this same line in Massachusetts altitudes of 1200 to 1400 feet are numerous, and one peak to the east rises to over 2000 feet. Westerly of the line the plateau falls off sharply to the Connecticut River, which in northern Massachusetts has an elevation of 200 feet or less. On the line still farther, in Connecticut, altitudes of 900 to 1000 feet are frequent and two eminences near the town of Union reach almost 1300 feet. The formation changes, though, into one of high, flat, parallel ridges flanking broad river valleys, all taking a generally north and south direction and gradually losing altitude as they approach the coast.

On Mt. Washington, 6288 feet, the highest peak in northeastern North America, the tree-line is at about 5000 feet. Above this elevation the flora is arctic-alpine. In the Sandwich Range, 25 miles to the south, I have found breeding at about the 3000-foot level such birds as the Canada Jay (*Perisoreus canadensis*), Acadian Brown-capped Chickadee (*Parus hudsonicus littoralis*), Bicknell's Gray-cheeked Thrush (*Hylocichla m. minima*), and, once, the American Three-toed Woodpecker (*Picoïdes tridactylus bacatus*). My observations of the last-named species there are quoted by Bent (1939: 120).

Farther south in New Hampshire the flora and summer avifauna of the plateau continue to conform to the altitude rather than the latitude in possessing a strong northerly tinge. Thus, near Fitzwilliam, New Hampshire (maximum altitude in the vicinity nearly 1900 feet), not far north of the towns of Royalston and Winchendon in Massachusetts, trees such as the balsam (*Abies balsamea*), red spruce (*Picea rubens*), and larch (*Larix laricina*) are common; hemlock (*Tsuga canadensis*), beech (*Fagus grandifolia*) and paper birch (*Betula papyrifera*) occur in moderate-sized stands; and the ground hemlock or yew (*Taxus canadensis*) is local. Over a period of 14 years I have found the following birds nesting in the region at 1000 to 1300 feet elevations: Alder Flycatcher (*Empidonax traillii*), Olive-sided Flycatcher (*Nuttallornis borealis*), Winter Wren (*Troglodytes troglodytes*), Magnolia Warbler (*Dendroica magnolia*), and Myrtle Warbler (*Dendroica coronata*). The White-throated Sparrow (*Zonotrichia albicollis*) is common. Near Royalston, Massachusetts, I saw a pair of Slate-

colored Juncos (*Junco hyemalis*) on June 17, 1938. Their behavior indicated that they were nesting.

John H. Conkey, a conservative field ornithologist who was Secretary of the Nuttall Ornithological Club prior to his removal to Ware, Massachusetts, in 1934, informs me (*in litt.*) that in the Ware and Quabbin Reservoir region of Massachusetts, which traverses about half of the state (roughly the half lying between the northern quarter and the southern quarter), the hemlock and paper birch are common, the red spruce uncommon, and the beech and yellow birch (*Betula lutea*) local. He informs me, too, that he considers the following to be characteristic summer birds: Alder Flycatcher, Brown Creeper (*Certhia familiaris*), Blue-headed Vireo (*Vireo solitarius*), Nashville Warbler (*Vermivora ruficapilla*), Black-throated Blue Warbler (*Dendroica caerulescens*), Blackburnian Warbler (*Dendroica fusca*), Northern Water-Thrush (*Seiurus noveboracensis*), and Canada Warbler (*Wilsonia canadensis*). My own scattered records over a period of years are corroboratory. Additionally, I recorded a Winter Wren near Winchendon in the aforesaid northerly quarter in a suitable breeding site, and a Myrtle Warbler and a White-throated Sparrow in the adjoining township of Ashburnham, all on June 7, 1947. Aaron M. Bagg informs me (*in litt.*) that he heard an Olive-sided Flycatcher in a spruce swamp near the Winchendon Township line on June 27, 1950. Data presented by E. H. Forbush (1927) clearly indicate that most or all of the above-mentioned birds are summer residents of this plateau region in Massachusetts.

In the course of numerous trips between Boston and Hartford, Allen H. Morgan and I became intrigued by the sparsely inhabited, densely forested highlands we crossed in the northeastern corner of Connecticut. Two exploratory trips made by Aaron M. Bagg to the region heightened our interest. After many delays we finally visited this area in early July, 1950. Bagg, unfortunately, was unable to join us. Arriving at Bigelow Hollow State Park, near the town of Union, on the evening of July 1, we camped there.

A notable feature of the Park is an extremely narrow, densely timbered, mile-long gorge, through which flows Bigelow Brook, the outlet stream from Mashapaug Pond, elevation 706 feet. Hemlock is dominant in this gorge. Descending at a moderate rate, the ravine debouches suddenly into a large, irregularly shaped pond, Bigelow Pond, elevation 636 feet, tucked in among 900-foot hills covered with hardwoods. The shores of the pond are badly fouled with a tangled mass of long-dead trees, many of them still standing. From the pond the brook continues its descent at a greatly decelerated rate, through the Yale Forest, meandering down a fairly narrow valley filled with alders. Hills covered with hardwoods rise to over 1000 feet at either side.

So much attention has been paid to the *southern* element in the bird life of south-central New England that ornithologists are all but unaware of the boreal element there. The part of northeastern Connecticut which I have briefly described just above, together with northwestern Connecticut, contiguous parts

of New York, and the New York-New Jersey-eastern Pennsylvania hills form a southward-projecting boreal 'finger' comparable to—though of course less pronounced and less southerly in extent than—that of the main Appalachian chain and that of the great Rocky Mountain system of the west. Merriam, in his "A Review of the Birds of Connecticut, with Remarks on their Habits" (1877: 1–2) and Sage and Bishop (1913: 8) mention, respectively, the 'Canadian Fauna' and 'Canadian elements in the avifauna' of Connecticut, but do not give much attention to them as such. The breeding status of several of the 'northern' birds of this area has not, to my way of thinking, been fully enough stressed anywhere.

This strong 'northerly tinge' of the bird life contrasts rather sharply with the 'Carolinian tinge' of the Connecticut River valley itself, an area which has been described by Bagg and Eliot (1937). The same may be said of the coastal plain region of northeastern Massachusetts, parts of which lie east of southern New Hampshire. This coastal area has been described in detail by Townsend (1905; 1920) and more briefly by Stubbs and Emilio (1931).

Worth repeating is the fact that one is never far from this southern element when doing field work in the plateau region. On July 1, in North Woodstock, Connecticut, some ten miles east of Bigelow Hollow State Park, Morgan and I saw a Turkey Vulture (*Cathartes aura*). We saw the same or another Turkey Vulture the following day near East Woodstock. Altitudes along the ridge tops in this area reach 700 to 900 feet. Aaron Bagg and Henry M. Parker, in their intensive study of the Turkey Vulture in Connecticut (MS) conclude that this 'southern' species has become a common migrant and summer resident in certain western and southern parts of the state, but believe that our Woodstock records are the first for the northeastern part of the state.

Of the 66 birds recorded (58 in Bigelow Hollow State Park proper) by Morgan and me on July 1 and 2, 1950, the following boreal species warrant comment. Unless otherwise stated, localities mentioned are within the Park.

Brown Creeper, *Certhia familiaris*. July 2, I watched a pair of these birds chasing each other around an islet in the pond below the gorge. E. Alexander Bergstrom, of West Hartford, informs Morgan (*in litt.*) of having seen the species on Talcott Mountain, outside West Hartford, on May 30 and June 6, 1943. Sage and Bishop (1913: 173) give no records for Connecticut between May 7 and September 19. Forbush (1929: 354) describes the species as "rare in summer in southeastern parts [of New England] and not yet reported as breeding in Rhode Island."

Hermit Thrush, *Hylocichla guttata*. At least three of these birds were singing the evening of July 1st, and the species was much in evidence the following day. Only one Wood Thrush, *Hylocichla mustelina*, was recorded in the immediate vicinity, although that species was exceedingly common elsewhere throughout the greater territory. Bagg recorded two Hermit Thrushes in a hemlock swamp in nearby Phoenixville on June 14, 1950. Bergstrom (*in litt.*) states that the species nests in some numbers in the yellow pine of the Farmington Valley west of Hartford and at times on Talcott Mountain. He adds that there are summer records for Mansfield Center and Tolland, towns not greatly distant from Bigelow Hollow State Park. Except for one Hartford County record, Sage and Bishop (1913: 178–179) restrict the

species in summer to the northwestern part of the state. Forbush (1929: 402) considers the species a "common summer resident throughout . . . northwestern Connecticut" but rare and local elsewhere in southern New England in summer.

Blue-headed Vireo, *Vireo solitarius*. We saw or heard this species at three places in the Park July 2. Sage and Bishop (1913: 146) consider it "very rare" in summer, but mention several breeding records for Eastford, less than 7 miles distant, air-line, from the Park. Forbush (1929: 191) considers the species a "rare local summer resident" in Connecticut.

Black-throated Blue Warbler, *Dendroica caerulescens*. We found this species twice within the Park on July 2 as well as at one place just outside on July 1. Bagg found "many" throughout the region in general on June 15, 1950. Sage and Bishop (1913: 154) mention breeding records for Eastford, but limit the summer distribution otherwise chiefly to western parts of the state, as does also Forbush (1929: 235).

Myrtle Warbler, *Dendroica coronata*. One of these birds was singing as we cooked supper on July 1, and we distinguished four territorial areas of the species the following day. By way of contrast, a Rough-winged Swallow (*Stelgidopteryx ruficollis*), rare in the days of Sage and Bishop but now well distributed even in Massachusetts, flew back and forth repeatedly not far from our fireplace. Sage and Bishop did not record the Myrtle Warbler in summer. Forbush (1929: 238) states that the species "summers and possibly breeds locally in the hills of northwestern Connecticut." J. A. Farley (1919) observed a female and found a nest just over the state line near Webster, Massachusetts, on May 17, 1919.

Blackburnian Warbler, *Dendroica fusca*. As might be expected in a large hemlock stand, this species proved to be almost common. (On June 14, 1950, Bagg had found it at four places in and near Phoenixville, Connecticut. The following day he had found it in numbers throughout the area in general.) Bergstrom informs me that there are June records for Tolland and Willington, towns which lie within the plateau region. Also, he has found the species on Talcott Mountain in summer. Sage and Bishop (1913: 157) limit the species' summer distribution to northwestern parts of Connecticut. Forbush (1929: 258) calls it a "rare summer resident, less rare in western parts."

Northern Water-Thrush, *Seiurus noveboracensis*. We heard this species singing the evening of July 1. On July 2 we heard two singing. Morgan succeeded in seeing both birds; I saw one. Bagg had seen one at the same spot on June 15. Sage and Bishop (1913: 160) give no records for the state between June 3 and August 3. Forbush (1929: 281), while stating that the species is not known to breed in Connecticut, comments that both this species and the Louisiana Water-Thrush (*Seiurus motacilla*) "are found in the same localities in western Massachusetts, across the entire state where their respective ranges overlap, and Mr. Harry S. Hathaway tells me that he has found both species breeding in the Kingston swamp in Rhode Island." At Bigelow Pond five Louisiana Water-Thrushes were in evidence. *Motacilla* and *noveboracensis* were practically together at times. The habitat was fairly typical of that in which I customarily find the Northern Water-Thrush in summer in northern New England, and both species were concentrated in a rather small strip of shore-line. No water was coming over the spillway out of Mashapaug Pond, and there was only a sluggish flow from underground seepage lower down in the outlet brook. Conceivably, drying up of the brook may have caused the Louisiana Water-Thrushes to vacate what, at times of good water conditions, would be their normal breeding territory. Also, they may have been occupying territory along another small but rapid stream flowing into the pond almost in the center of the jointly-shared shore. Both Forbush (1929: 284) and Peterson (1947: 205) point out, however, that the Louisiana Water-Thrush does, at times, inhabit wooded swamps. I have discovered this species three times recently in such swamps in eastern Massachusetts, a region where practically no streams maintain a head of swift water the summer through.

Canada Warbler, *Wilsonia canadensis*. We recorded this species at five places in the Park on July 2. With difficulty we succeeded in seeing two singing males. Bergstrom has recent

summer records for Hadlyme and Barkhamsted (brood in 1941), in the coastal area and western highlands respectively. Bagg found the species near Phoenixville on June 14, 1950. Sage and Bishop (1913: 165) state that it "breeds more or less regularly in the northwestern part of the state, although few nests have been taken." Forbush (1929: 308) calls it "an uncommon to rare local summer resident" in Connecticut. J. A. Farley (1919: 582) observed a pair building a nest a short distance over the state line, near Webster, Massachusetts, on May 23, 1919.

Rusty Blackbird, *Euphagus carolinus*. Bagg saw one of these birds at Bigelow Pond in the Park on June 14, 1950, but was unable to relocate the bird the next day. On July 2, within a few yards of the same pond, Morgan had a fleeting glimpse of what he felt sure was a Rusty Blackbird as it disappeared into a conifer under which I was standing. The bird uttered one short note which both of us attributed to this species. The pond and its outlet bear a strong resemblance to sites at which I customarily find the species in summer in Maine, but positive proof of nesting is lacking and the bird should be considered a straggler. I know of no occurrence of the species in summer nearer than Moosilauke. Sage and Bishop (1913: 114) give no dates for the entire state between May 13 and September 15.

White-throated Sparrow, *Zonotrichia albicollis*. From one spot, July 2, we could hear three of these birds singing. Forming an incongruous background was the insistent and monotonous song of a Prairie Warbler (*Dendroica discolor*). Sage and Bishop (1913: 129) limit the summer range of the White-throated Sparrow to the northwestern portion of the state. Forbush (1929: 73) states that the species breeds casually in the western highlands.

Summary

The summer bird life of the hilly, sometimes mountainous, plateau which extends from the mountains of New Hampshire southerly across Massachusetts and Connecticut to the coast of Long Island Sound is definitely northern in its affinities. The maximum elevations of this plateau gradually decrease to the southward, but among the breeding birds of Bigelow Hollow State Park, in northeastern Connecticut, are the Brown Creeper, Hermit Thrush, Blue-headed Vireo, Myrtle Warbler, Blackburnian Warbler, Black-throated Blue Warbler, Canada Warbler, Northern Water-Thrush and White-throated Sparrow. The Rusty Blackbird has been seen in summer. The Louisiana Water-Thrush, a southern species, breeds locally side by side with the Northern Water-Thrush, possibly as a result of drying up of the streams normally preferred. Most of the northern birds just mentioned have been known to inhabit northwestern Connecticut in summer, but their ***breeding*** in northeastern Connecticut has heretofore received little or no mention in the literature.

Acknowledgements

I am deeply indebted to Allen H. Morgan, for several years a resident of Hartford, Connecticut, but now of Wayland, Massachusetts, for deferring the writing of this paper in my favor and for supplying valuable information and constructive criticism. I am grateful also to Aaron M. Bagg, of Holyoke, Massachusetts, to E. Alexander Bergstrom of West Hartford, Connecticut, and to John H. Conkey, of Ware, Massachusetts, for confirmatory data put at my disposal.

LITERATURE CITED

BAGG, A. C. AND S. A. ELIOT, JR.
1937 Birds of the Connecticut Valley in Massachusetts. The Hampshire Bookshop, Northampton, Massachusetts.

BENT, A. C.
1939 Life histories of North American Woodpeckers. *U. S. Natl. Mus. Bull.* 174.

EMILIO, S. G.
1940 Field-list of the birds of Essex County, Massachusetts. Second Edition, Revised. Essex County Ornithological Club.

FARLEY, J. A.
1919 Nesting of the Myrtle Warbler in southern Massachusetts. *Auk*, 36: 581–582.

FORBUSH, E. H.
1927; 1929 Birds of Massachusetts and other New England states, Vols. 2 and 3. Mass. Dept. Agric., Boston.

MERRIAM, C. H.
1877 A review of the birds of Connecticut, with remarks on their habits. *Trans. Conn. Acad.*, 4: 1–2.

PETERSON, R. T.
1947 A field guide to the birds. Houghton Mifflin Company, Boston.

SAGE, J. H. AND L. B. BISHOP
1913 Birds of Connecticut. State Geological and Natural History Survey. Bull. 20.

STUBBS, A. P. AND S. G. EMILIO
1931 List of birds of Essex County, Massachusetts. *Bull. Essex County Ornith. Club.*

TOWNSEND, C. W.
1905 Birds of Essex County, Massachusetts. *Mem. Nuttall Ornith. Club. No. 3.*
1920 Supplement to the birds of Essex County, Massachusetts. *Mem. Nuttall Ornith. Club. No. 5.*

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NESTING OF THE PARULA WARBLER IN MICHIGAN

BY RICHARD AND JEAN GRABER[1]

WHILE making a distributional study of the birds of Wilderness State Park in Emmet County, northwestern Lower Michigan, from June 9 to August 5, 1949, we observed the nesting of four pairs of Parula Warblers (*Parula americana*). This species has long been known to summer in Michigan, but up to 1938 no actual nest had been reported (Van Tyne, 1938: 32). The May 12 "nesting" date published by Chapman (1932: 454) apparently was a migration date from Wood (1908. *Auk*, 25: 12). Wood's manuscript notes include no unpublished nesting data.

Wilderness Park occupies 7,800 acres, including Waugoshance Point—a narrow peninsula extending westward into Lake Michigan and forming the northern boundary of Sturgeon Bay. The sandy north shore of Waugoshance Point is bordered first by small dunes sparsely covered with *Juniperus horizontalis* and *Arctostaphylos uva-ursi*, then by a forest-edge of white pine (*Pinus Strobus*), red pine (*Pinus resinosa*), spruce (*Picea* sp.), balsam (*Abies balsamea*), white cedar (*Thuja occidentalis*), aspen (*Populus* sp.), and white birch (*Betula alba*). The south shore of the Point and the whole of Sturgeon Bay are rocky, with *Scirpus* marshes extending about 50 yards inland to the forest-edge of cedar and scattered spruce, aspen and birch.

The only Parula Warblers we encountered inhabited the forest-edge of the Point and Sturgeon Bay. We located 15 singing males—12 on the north shore of the Point, one on the south side of the Point, and two farther south on Sturgeon Bay. We found four occupied and two old nests all in a line along the north side of the Point.

The Nests

The four active nests (Nos. 1, 2, 3, 4) and the two old nests were very much alike in situation. Each was among 5- to 12-inch-long strands of *Usnea* on the east side of an unshaded, dead or nearly dead, middle-sized balsam, on a small, not very steady limb. The entrance generally used was on the side next to the main trunk, but at times the birds would force their way through the canopy of lichen in another place. The average height of the 6 nests was about 10 feet. Five of them were so hidden in the *Usnea* that to see them we had to stand directly underneath.

The nests were well-woven, compact, semi-pensile structures resembling those of the Orchard Oriole (*Icterus spurius*). They were made of *Usnea*, usually with a few fine pieces of grass two to three inches long. The lining material seemed to be no finer than the rest.

[1] Contribution from the University of Michigan Biological Station, Cheboygan, Michigan.

TABLE 1

ACTIVE PARULA WARBLER NESTS

Nest	Height	Measurements in Centimeters				Distance between nests
		Inside diam.	Outside diam.	Inside depth	Outside depth	
1	about 10′	4.5	7.5	5.0	7.5	About 500 yards from Nest 2
2	10′ 8″	4.9	6.5	4.5	5.8	889 feet between Nests 2 and 3
3	8′ 10″	4.0	7.0	4.5	5.5	392 feet between Nests 3 and 4
4	9′ 3″	4.1	7.0	5.2	5.7	

Nest 1, found June 28, contained 2 young birds (which left in good order on July 3).

Nest 2 was just being built when we found it July 11. It was made entirely of *Usnea* and was the only nest so composed. We believe that only a single egg was laid in this nest. The egg was laid on the morning of July 15, and was incubated for 15 days before it was removed by some unknown predator. An old nest which had much grass in it was in the same tree about 3 feet away (height 13 feet). This nest almost certainly had been built earlier in the summer of 1949.

Nest 3 held 1 egg when we found it July 12. Two more were laid, respectively on July 13 and 14.

Nest 4 held 2 eggs when we found it July 12, and another egg was laid July 13.

These clutches were small. Wilde (1897: 293) found the average clutch to be 4 eggs. Barrows (1912: 591) stated that an average clutch numbered 3 to 5 eggs, and Chapman (1932: 455) gave 4 to 5 as the average number in a clutch. The lateness of the nesting observed by us may have had something to do with the smallness of the clutches. Wilde (1897: 291) gives the middle of May as the time nests are built. Mousley (1926: 184) reported a nest being built as early as May 25.

Redstarts (*Setophaga ruticilla*), Song Sparrows (*Melospiza melodia*), Myrtle Warblers (*Dendroica coronata*), and Oven-birds (*Seiurus aurocapillus*) were nesting near the Parula Warbler nests.

At the four nests the parent birds, both males and females, varied considerably in color. Two males were quite handsome, with wide red and blue throat-bands, while another male could scarcely be distinguished from its mate. Three females had clear yellow throats or showed only a trace of blue. One bird, whose mate we never saw, had a narrow throat-band of blue with a hint of red in it. We assumed that this bird was a female, for it was very faithful in

FIG. 1. Female Parula Warbler returning to nest (No. 1) with food for young. Photographed at Wilderness State Park, Emmet County, Michigan, on June 30, 1949, by Richard and Jean Graber.

incubating the eggs and caring for the young. Of 45 skins of female Parula Warblers examined at the University of Michigan Museum of Zoology, six had coloration similar to that of this bird.

We found Nest 2 at about 11 a.m. on July 11, through chancing to see the female fly to the site. We believe that she had started it earlier that day. We watched her working for an hour (until 12 m.). During much of this period she devoted her attention to making a cylindrical curtain of *Usnea* which was suspended above and about the nest. She pulled and wove the fibers together with an extremely rapid shuttling of her bill. When she had completed the curtain to her satisfaction, she began gathering *Usnea* for the nest itself. This she obtained not only in the nest-tree but also in trees close by.

A large white pine about 6 feet from the nest had tufts of *Usnea* growing on its trunk. Often she flew to this tree and, hopping down its trunk in the manner of a Black and White Warbler (*Mniotilta varia*), pulled a few fibers (2 to 3 inches long) from the bark and carried them to the nest. After weaving these in, she sometimes hopped out to the entrance and cocked her head from side to side as though appraising the effect. Occasionally when leaning over a limb, pulling at a fiber, she lost her balance, fell off, and fluttered in mid-air still hanging onto the fiber with her bill. Once we saw her swing upside-down, chickadee-fashion, while working at the bottom of the nest from the outside.

On one occasion the male came to a tree near the nest-tree and watched the female working. After a few minutes he flew to the nest, whereupon we heard a loud snapping of bills and saw both birds fly away. Presently they returned, alighted in a tree six feet from us, and chipped loudly. When the male flew off the female returned to her nest-building. Later the male came again and chipped at us but did not go to the nest—at which the female was busy working. She continued with her work, seemingly paying no attention to his *chip*. Throughout most of the hour the male sang at 20-second intervals in birches 20 to 30 yards from the nest. By the end of the day the nest had taken shape but was very thin-walled. We could see through the bottom.

The next day (July 12) we made continuous observations at the nest from 8:33 a.m. to 12:30 p.m. During this period the female thickened the walls and bottom with *Usnea* gathered nearby. The male was in the vicinity (we heard him sing 3 times), but he did not appear until another male flew into a tree about 10 feet from the nest. Both owners of the nest resented this intrusion. Flying to the tree in which the visitor perched, they gave angry *buzzing* notes. The visitor left, pursued by the male, and the female returned to the nest. Most of her time was spent strenuously gathering *Usnea*, making trips to the nest at 1- to 1½-minute intervals, and spending only 10 to 15 seconds at the nest each time. When she paused to feed, she flew to small conifers near the nest.

Once the male visited the nest while the female was gone. He looked at it from several angles and even entered; then, with a few scarcely audible *chips*, he flew away. Later he came and coaxed the female to leave with him. She

followed a short distance and then flew back to the nest. Again the male approached and this time succeeded in coaxing the female away. Both birds flew out of sight. On one occasion a wandering band of Black-capped Chickadees (*Parus atricapillus*) excited the male when they approached, but the female went on gathering *Usnea* as usual.

The female seemed to work more slowly before than after 10:30 a.m. It took her, without any help from her mate, four days to build the nest. On the fifth day she laid the one and only egg of the clutch. We observed that incubation began with the laying of this egg, and though we checked it several times each day between dawn and dark of the fifteen days the egg was incubated, we never saw a second egg.

Incubation

Nest 3 contained one egg (which had a tiny triangular hole in its side) July 12. A second egg was laid on the morning of the thirteenth. The female was sitting on the two eggs at 11:30 o'clock. The third and last egg was laid the following morning. We believe that incubation started just after the laying of the second egg. We did not see the female anywhere in the vicinity of the nest on July 12, but on July 13 we flushed her from the nest twice (11:30 a.m. and 4:30 p.m.). One egg hatched July 26, another the following day. (The egg with the hole in it did not hatch.)

Nest 4 contained two eggs when we visited it late in the day on July 12, and a third was in it at 11:35 a.m. the following day. On the morning of July 24 the three eggs were intact, but the female seemed unusually excited and reluctant to leave. On the following morning the nest held one young bird and two eggs (no eggshells). The two eggs did not hatch. Since we did not mark the eggs, we do not know which one hatched. The incubation period was at least 12 days, in any event, and possibly as long as 14 days.

Nest 3. On July 21 (the eighth day of incubation), at 7:30 a.m. we flushed the female from her clutch of three eggs. She feigned injury as she left the nest, spreading her tail and flying close to the ground, then rising to a perch 10 feet from the nest-tree where she chipped excitedly. She continued the alarm for 20 minutes, then left the area. In the next 2 hours and 20 minutes, the female came to the nest-tree repeatedly, but did not enter the nest, although once she flew directly to it. On one occasion, after an absence of 2 minutes, she returned with the male. He flew to the top of the nest-tree, then to a perch above us, chipped a few times, and left. This was the only time during the incubation period that we observed the male at the nest-tree.

The marked excitability of the female at this nest was evident from several characteristic actions, the commonest of which was wiping the sides of her bill on some branch. She did this even when she had eaten no food, and the mannerism seemed to be a sort of nervous reaction to the intruder. After the eggs had remained uncovered 2 hours and 40 minutes, we discontinued observation.

Nest 4. We began observations at 7:20 a.m., July 21 (ninth day of incubation). A bird was sitting on the nest at that time. The only bird we ever saw at this nest was almost certainly a female, though it was very handsomely colored.

Only once did we hear a male singing near Nest 4, and then only for a few minutes at a time when the female was incubating.

The incubation rhythm was quite regular. During 7 hours of observation on July 21, the bird left the nest 12 times, the shortest inattentive period having been 2 minutes, the longest 37 (average 11). The 13 attentive periods averaged 21½ minutes. Five of the seven hours were spent incubating.

The female behaved differently the following day. From 5:15 a.m. to 8:15 p.m. she left the nest 36 times for an average of only 4 minutes, and incubated the rest of the time. The longest period spent off the nest was 6 minutes, the shortest, 2. The attentive periods varied between 10 and 43 minutes (average 21 minutes).

The periods of incubation and of rest tended to be longer in the morning, though not markedly so. A marked variation occurred after 7:00 p.m., when both periods became increasingly shorter. At 8:15 we had to stop our observation. The sun was already below the horizon, and the nest a dark silhouette, yet only 10 minutes before our leaving the bird was away from the nest. It seems probable that this was close to the last trip of the day. Twelve and a half of the 15 hours the bird had spent on her eggs.

The activity of the bird during these periods of observation followed a very uniform pattern. She left and returned to the nest quickly and quietly. In leaving the nest she almost invariably flew inland in the same direction, and returned via the same route, usually flying to a favorite perch below the nest, from which she hopped to the side entrance. We frequently noted movement in the nest from 1 to 3 minutes before she actually departed.

We never followed the bird during her away-from-the-nest periods, though in these short intervals she could not have gone far. Very often upon returning she wiped her bill on a branch as if cleaning her mandibles before entering the nest.

Throughout the period of our study, numerous bands of Black-capped Chickadees, Golden-crowned Kinglets (*Regulus regulus*), and warblers wandered about the woods. Several times we saw one or more of these birds hopping about the nest-tree within 2 or 3 feet of the incubating Parula Warbler, yet neither did they show interest in the nest, nor were they driven away.

Nest Success

The June nest held two young birds when we found it, and these left in good order (as above stated). We do not know how many eggs had been laid in this nest.

The three July nests held a total of seven eggs, of which three hatched—two in one nest (three eggs), one in another (three eggs), none in another (one

egg). Of the three young, one left the nest in good order. The two siblings in one nest were destroyed by some predator when they were about seven days old.

Grand total of eggs in the four nests: at least 9; of young hatched: 5; of young which lived to leave the nest: 3 (one of the latter we collected, July 3).

A less than one-day-old nestling (the second of Nest 3) which we critically examined on July 28 had a sparse patch of rather long silky white down on the head, and another along the mid-line on the dorsum. Otherwise it was naked, and the skin, bill, and legs were all of about the same shade of pinkish yellow. Tiny dark blood quills were visible through the skin of the wings. Late in the day on July 29 we examined this bird again, finding that the bill had become slightly more yellow, the incoming feather tracts more obvious, and the down of the head and back a trifle darker. On July 30 the down appeared to be even darker.

At Nest 1 (June) the male parent regularly brought food to the two young. The male and female at this nest were so similar in color that we would have entertained grave doubts concerning the male's coming to the nest at all had we not seen *both* birds there with food on several occasions. At Nests 2 and 3 the male parent did not bring food at all regularly. Not once did we recognize a male bird at Nest 4.

The behavior of the parent birds at Nests 3 and 4 merits special discussion. We spent 12 hours observing these nests on July 27 and two hours observing Nest 4 on August 4. The wildness of the female at Nest 3 has already been mentioned. This female brought food to her 2 nestlings only 14 times during a 5-hour period on July 27. The longest interval between feedings was 68 minutes, the shortest 5, the average 20. She brooded her young once for a period of 19 minutes. The male approached the nest with food only once. When he was within a few inches of the nest, the female flew swiftly at him driving him from the nest-tree. During the remaining two hours of our observations that day we did not see the male again. We were stationed fully fifty feet from the nest-tree, yet our presence obviously distressed the female. Occasionally she settled down into the nest as if to brood, then left hurriedly.

The females at Nests 3 and 4 gathered food within a few yards of the nest-trees, usually in conifers. Their behavior was kinglet-like as they hopped quickly about the branches. Occasionally they fluttered at the end of a twig. They found numerous green lepidopterous larvae among the pine needles. Frequently they caught a May fly (Ephemerida) or another of the winged insects that abounded along the shore.

At Nest 4 the female had only one nestling to tend, yet her feeding rate was almost as great as that of the female at Nest 3. During a six-hour observation period (July 27) she made 19 trips carrying food. The shortest interval between feedings was one minute, the longest 51, the average 19. She brooded the nest-

ling immediately after 14 of the 19 feedings. The shortest brooding period was six minutes, the longest 27, the average 17 (total: almost four hours of brooding during that particular observation period).

At no time did we see a parent bird remove a fecal sac from a nest. Mousley (1924: 268) reported that he never saw a parent Parula Warbler carrying off a fecal sac. The adult probably swallows the fecal sac while its head is out of sight within the nest.

On the morning of August 4 we unintentionally so disturbed the young bird in Nest 4 that it left prematurely. Neither adult was in the immediate vicinity at the time. The young bird, which was 10 days old, was well feathered, and quite capable of hopping from branch to branch, but did not attempt to fly. It was in handsome juvenal plumage. It was, generally speaking, blue-gray above (with a greenish wash on the back) and white below, with distinct white wing-bars.

When the female parent returned, with a May fly in her bill, she gave sharp chips of alarm as she hopped toward the nest. The young bird, which was sitting quietly on a branch very near the nest, did not beg for food even when its parent was within a few inches. The adult looked at the nestling but peered into the nest three times before hopping to the young bird and poking food at its bill. This did not evoke a begging reaction and the parent swallowed the food and flew off. In about 10 minutes she returned with a large brown larva, went directly to the nest, looked in, then hopped over to the young bird, fed it and left. When the female returned with more food, she made an unsuccessful attempt to feed the young one, then moved toward and entered the nest. Settling down, she grew quiet, as if brooding the empty nest. After remaining in the nest for 8 minutes she began moving about restlessly, climbed out of the nest, and flew off. Presently she returned with more food. This time the young bird fluttered its wings, begged, jumped to the branch on which its mother had alighted, and was fed promptly.

The female continued to bring food at three- to five-minute intervals. Often, following what must have been a very powerful instinct, she went to the nest before going to the nestling, but this interest in the nest gradually waned. Once we saw her take a fecal sac as it was passed, and carry it away. At other feedings she looked for sacs, but this was the only instance in which she carried one away. The behavior of the young bird and also that of the adult clearly indicated that the juvenile had left the nest prematurely.

While the female was away, the young bird preened itself energetically and changed its position frequently, though it remained near the trunk of the nest-tree. Its colors matched those of its surroundings remarkably well. The lichens *Usnea cavernosa* and *Parmelia physoides*, which grew so abundantly on the branches of the nest-tree, were of almost the same shade of bluish gray as that of the upper parts of the young bird.

Acknowledgements

We hereby wish to thank the Michigan Conservation Department, especially Superintendent Grant Wykhuis of Wilderness State Park, for the kind treatment and many privileges extended to us. We are especially indebted to Dr. Olin S. Pettingill Jr., who advised us and guided our study.

Summary

The Parula Warblers which inhabited Wilderness State Park, Emmet Co., Michigan, in the summer of 1949 seemed to be nesting principally in the forest-edge along the shore of Lake Michigan. Four active and two old nests, situated in dense clumps of the lichen *Usnea cavernosa*, averaged 10 feet above ground. All six nests were in medium-sized, dead or nearly dead balsams (*Abies balsamea*). They were semi-pensile, and were made almost wholly of *Usnea*. Three of the four active nests were finished when found. The incomplete one was finished entirely by the female, while the male sang nearby and defended the territory. Complete clutches of 1, 3, and 3 eggs were observed. Grand total of eggs in the four nests: at least 9; of young hatched: 5; of young which lived to leave the nest: 3. At two nests the incubation period was not less than 12 nor more than 14 days. Incubation rhythm was regular. Incubation was performed exclusively by the female, who left the nest for a short period every 20 to 30 minutes. Both sexes fed the young, though the male was less active than the female in doing so. One young Parula Warbler left the nest prematurely at the age of 10 days.

Literature Cited

Barrows, Walter Bradford
1912 Michigan Bird Life. Special Bull. Dept. of Zoology and Physiology, Mich. Agricultural College, Lansing.

Chapman, Frank M.
1932 Handbook of Birds of Eastern North America. Revised Edition. D. Appleton and Co., New York.

Mousley, Henry
1924 A study of the home life of the Northern Parula and other warblers at Hatley, Stanstead County, Quebec, 1921–1922. *Auk*, 41: 263–288.
1926 A further study of the home life of the Northern Parula, and of the Yellow Warbler and Ovenbird. *Auk*, 43: 184-197.

Van Tyne, Josselyn
1938 Check list of the birds of Michigan. *Univ. Mich. Mus. Zool. Occ. Papers No.* 379.

Wilde, Mark L. C.
1897 Nesting of the Parula Warbler (*Compsothlypis americana*) in Cape May County, New Jersey. *Auk*, 14: 289–294.

Wood, Norman A.
1908 Notes on the spring migration (1907) at Ann Arbor, Michigan. *Auk*, 25: 10–15.

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PATTERN AND RATE OF CRANIAL 'OSSIFICATION' IN THE HOUSE SPARROW

BY ROBERT W. NERO[1]

Determination of skull condition has been long accepted as a method of distinguishing immature from adult passerine birds. Chapin (1946: 35–37), for example, described this method, suggesting that various groups of birds should be studied in order to test its reliability. Davis (1947) attempted to correlate bursa and gonadal development with the ossification of the skull. Miller (1946) described a method of aging live birds, based on skull changes. Although commonly referred to as "ossification," the changes which occur involve the formation of a double layer of bone separated by small bony columns. In his description of this process of cranial development, Miller stated (*loc. cit.*, p. 33): "The skull of a passerine bird when it leaves the nest is made up of a single layer of bone in the area overlying the brain; at least, the covering appears single when viewed macroscopically. Later the brain case becomes double-layered, the outer layer being separated from the inner layer by an air space across which extend numerous small columns of bone. It is not necessary to section the bone to determine the condition. Externally the skull of the immature bird appears uniform and pinkish in live or freshly-killed specimens. The skull of the adult is whitish, due to the air space, and also it is finely speckled as a result of the dense white bony columns between the layers." Miller and others suggest that this condition is attained progressively, from posterior to anterior. Harrison and Harrison (1949), who have dealt with this subject in close detail, refer to the developmental process as "pneumatisation." The reader should consult their important paper for further aspects of this problem. The present paper describes the pattern and rate of cranial development in one species—the House Sparrow, *Passer domesticus*.

Methods and Results

Specimens of known age were obtained through the recovery of banded young. A total of 346 nestling sparrows, aged according to wing and bill characters as described by Weaver (1942: 183–187), were banded at Madison, Dane County, Wisconsin, between May and August, 1949. Of these, 51, or nearly 15 percent, were recovered as fledged immatures of various ages during the period May,

[1] I wish to thank the many persons who have helped in the gathering of data on which this paper is based. Special thanks are due two members of the University of Wisconsin faculty—Dr. Robert A. McCabe, of the Department of Wildlife Management, for encouragement and advice in the beginning of the study, and Dr. John T. Emlen, Jr., of the Zoology Department, for careful reading and criticism of the manuscript.

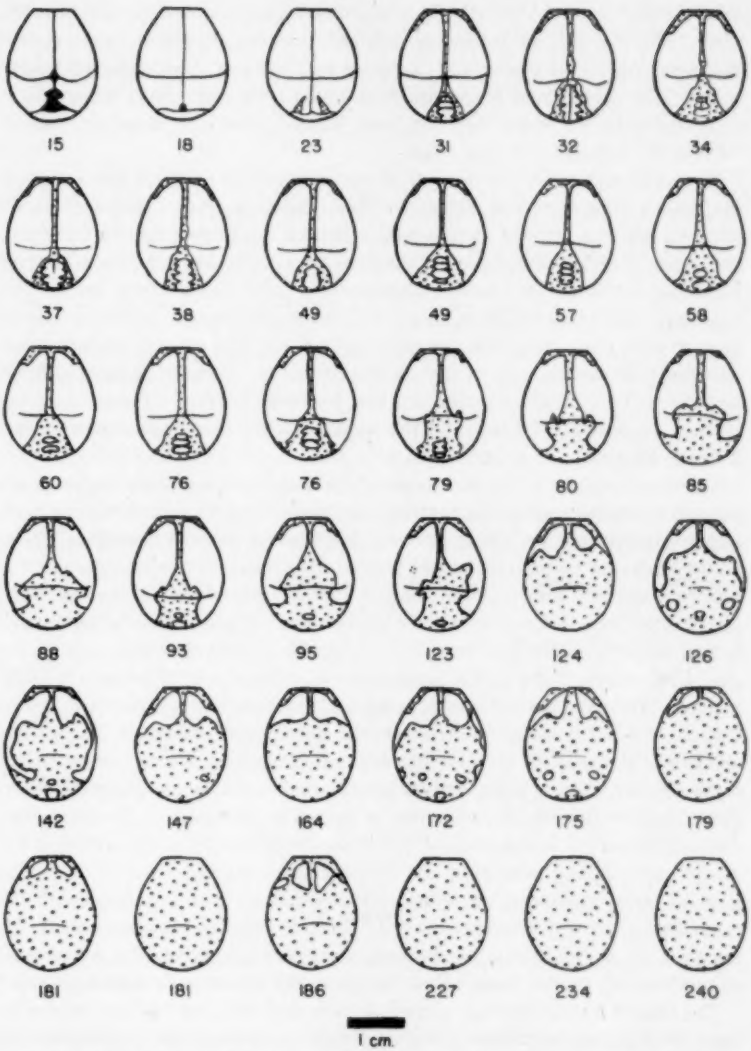

FIG. 1. Dorsal view, crania of 36 wild House Sparrows showing ossification pattern. Numbers under drawings indicate age in days.

1949, to March, 1950. Over 1600 sparrows were killed in recovering these banded birds. The methods of collecting included trapping, shooting into daytime flocks and night tree roosts, and capturing by hand and shooting in night barn roosts. The majority of recoveries were taken from night barn roosts at, or near, the point at which they had been banded. One bird, however, was recovered at a distance of four miles.

The skull-ossification patterns of 36 representative birds from this series are graphically represented in Figure 1. These drawings show a series of dorsal views of the cranium, the frontal border of each skull being toward the top of the figure. Frontal sections were obtained by cutting along a line extending from just dorsal to the foramen magnum to a point dorsal to the orbits. The drawings were projected from accurate linear measurements, giving a relative picture with some distortion towards the borders. The number beneath each drawing indicates the age in days of the particular specimen. The solid areas in the first two drawings in the top row indicate connective tissue; the clear areas, a single layer of bone; and the speckled areas, the double-layered bone. The fine lines indicate sutures.

These sections show that formation of the double layer of bone begins in the posterior parietal and exoccipital regions about 23 days after hatching, and appears in the median suture between the frontals shortly thereafter. Up to about 80 days it is confined largely to lateral extension of the area posterior to the frontoparietal suture. After this age, growth proceeds in a somewhat arm-like fashion from the posterior third of each frontal bone towards the antero-lateral corners, resulting in near-division of the frontals into four, and finally two, clear areas. These latter anterior areas are the last to become double-layered. When the cranial roof is completely double-layered, the bird is considered an adult, at least so far as cranial criteria are concerned. These clear areas may disappear as early as 181 days after hatching or may persist to 221 days, the latter figure being derived from a skull which is not illustrated here. Note that the pattern of ossification is generally symmetrical. In some cases where it is not, as in the skull of 123 days, there is a peculiar hardening (indicated as stippling outside of the circumscribed stippled area) of the single layer of bone, suggesting an injury, which seems to have interfered with the normal progress of development in the area. According to Harrison and Harrison (*loc. cit.*, p. 64) "the whole process is considerably slowed down and even stopped by any serious disease that the particular bird may be suffering from."

The area of double-layering of each of these skull sections has been measured from the drawings by means of a planimeter. The percentage of ossification as calculated on this basis yielded the data shown in Figure 2. In this graph the percentage of the opaque area (stippled) is computed against the age in days, each dot on the curve representing one of the drawings in Figure 1. This curve shows that the thickening of the cranium of the House Sparrow progresses at

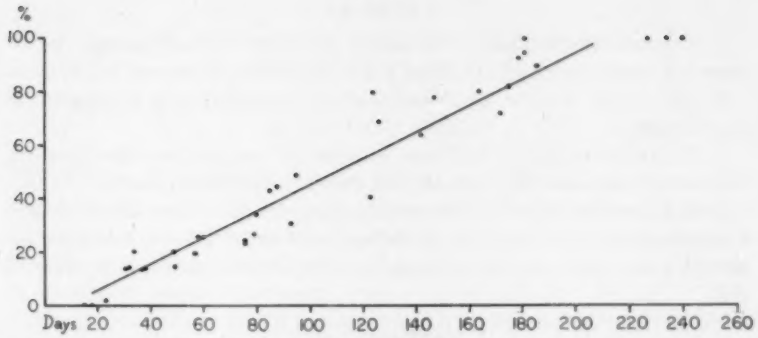

FIG. 2. Curve showing relationship of percentage of cranial ossification to age in days in the House Sparrow.

a fairly constant rate.

In the early stages of this study it was decided to raise young sparrows in cages, killing them at such times as to obtain a series of birds of known age, the supposition being that it would be difficult to recover sufficient banded nestlings. Figure 3 shows the skulls of 12 of these birds. These show consider-

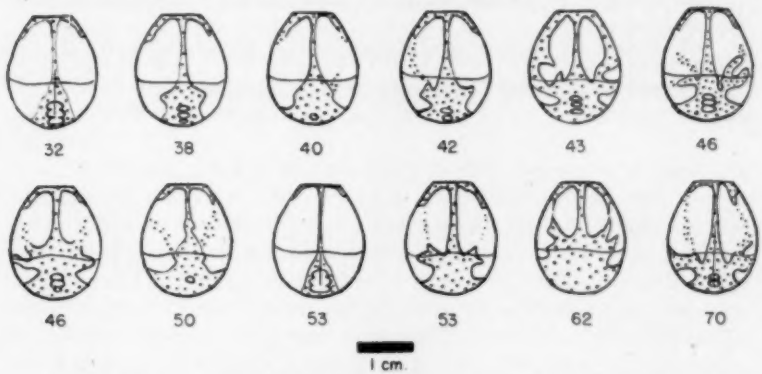

FIG. 3. Dorsal view, crania of 12 hand-reared House Sparrows showing ossification pattern. Numbers under drawings indicate age in days.

ably more variation in pattern and rate of development than those taken from the field. These irregularities may possibly be attributed to an abnormal diet, to an excess of head injuries as a result of caging, or to both. Irregular hardening of the single bone layer, as described above in the 123-day-old bird, is evident in seven specimens.

Summary

1. Fifty-one House Sparrows of known age were obtained through the recovery of banded nestlings. The ages of these birds ranged from 15 to 240 days.

2. The crania of these specimens showed a progressive and symmetrical growth pattern.

3. Complete ossification had been attained in one specimen 181 days old, but another specimen 221 days old still showed small clear areas.

4. Skull sections from 12 birds reared in captivity show more variability and a less symmetrical pattern than do those of wild birds. There is also more abnormal bone formation, due, perhaps, to injury from caging and to artificial diet.

Literature Cited

Chapin, James P.

1946 The preparation of birds for study. *Am. Mus. Nat. Hist. Science Guide* No. 58.

Davis, David E.

1947 Size of bursa of Fabricius compared with ossification of skull and maturity of gonads. *Jour. Wildl. Mgt.* 11: 244–251.

Harrison, J. G., and D. L. Harrison

1949 Some developmental peculiarities in the skulls of birds and bats. *Bull. Brit. Ornith. Club.* 69: 61–70.

Miller, Alden H.

1946 A method of determining the age of live passerine birds. *Bird Banding*, 17: 33–35.

Weaver, Richard Lee

1942 Growth and development of English Sparrows. *Wilson Bulletin*, 54: 133–191.

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THE SONG AND SONG-FLIGHT OF THE ALDER FLYCATCHER

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THE song of the Alder Flycatcher (*Empidonax t. traillii*) is well known but little understood—known in the sense that it is recognized, not understood in the sense that the meaning of song in relation to behavior and ecology is difficult to interpret. I cannot claim complete understanding, but the following is an attempt toward that end.

The main objective of this paper is to describe and discuss the song of the Alder Flycatcher from a physical point of view. A secondary objective is the describing of a hitherto unrecorded song-flight. The psychological aspects of the species' singing, particularly those relating the song to the breeding cycle, I hope to discuss in a later paper, when the entire ecology and nesting picture will also be given.

What is the song of the Alder Flycatcher? Peterson (1947: 152) describes it thus: "The regular song in New York and New England is a three-syllabled *wee-bé-o* with a hoarse burry quality, the accent on the middle syllable. The Ohio bird contracts this into a sneezy *fitz-bew* or '*witch-brew*' as distinctly different as that of any other two species of the genus. Possibly collecting would prove that subspecific differences existed." I came in recent years to associate the latter description with the song of the Alder Flycatcher in Wisconsin. This, however, may be more psychological than real. I have never heard the song *wee-bé-o*.

In the summer of 1943 I began a study of Alder Flycatcher ecology. The area used for study was a 40-acre plot of brushy marsh on the west shore of Lake Wingra in the University of Wisconsin Arboretum at Madison. The chief herbaceous cover was sedge (*Carex* sp.), aster (*Aster* sp.), goldenrod (*Solidago* sp.), sunflower (*Helianthus* sp.), joe-pye weed (*Eupatorium purpureum*), and nettle (*Urtica procera*). The woody cover was mainly elderberry (*Sambucus canadensis*), red osier dogwood (*Cornus stolonifera*), and willow (*Salix* sp.).

Allen W. Stokes and Arnold S. Jackson, Jr. worked with me in 1944. They

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spent part of the following nesting season in Maryland and California respectively, and both voluntarily sent word back to me that the *Empidonax traillii* songs they had been hearing sounded exactly like those they had heard in Wisconsin. On examining the phonetic descriptions of Alder Flycatcher song as presented in the literature, I was unable to detect any agreement on the song from the standpoint of geographic location. Table 1 presents a number of these

TABLE 1

PHONETIC EXPRESSIONS OF ALDER FLYCATCHER SONG

SONG	AUTHORITY	LOCALITY
Eastern: three syllables—*phe-bĕ-o* type		
Jee-je-ut	Hausman (1946)	Massachusetts
Ee-zee-e-ŭp	Chapman (1937)	Washington, D. C.
Che-beĕ-u	Minot, in Forbush (1927)	Massachusetts
Che-bēe-u	Nice (1931)	Oklahoma
Wee-bĕ-o	Peterson (1947)	New England-New York
Wit-ti-go	Widmann, in Butler (1897)	Indiana
Eaze-we-up	Howell (1932)	Florida-Alabama
Midwestern: two syllables—*fitz-bew* type		
Whip-whew	Breckenridge, in Roberts (1932)	Minnesota
Fitz-bew	Peterson (1947)	Ohio
Sweet-cheeun	Trautman (1940)	Ohio
Pit-too	Gibbs, in Barrows (1912)	Michigan
Greadeal	Miller, in Forbush (1927)	Massachusetts
Grea-deal	Silloway (1897)	Massachusetts
Re-pēal	Hyde (1939)	New York
Tick-weeah	Saunders (1935)	New York
Not classified		
Qui-deĕ	Hoffman (1904)	New York
Pree-pe-deer	Cooke, in Bailey (1908)	Western U. S.
Kee-wing	Coues (1903)	?
Raiz-wee	Bent (1942)	Massachusetts
Becky-weer	Sutton, in Todd (1940)	Pennsylvania

descriptions, some of which resemble each other, while others are singularly distinctive.

In discussing the question of subspecific differences with Roger T. Peterson in 1947 he told me that he had collected birds using the *fitz-bew* and others using the *wee-bĕ-o* song. Later when these skins were analyzed on a taxonomic basis by Dr. J. W. Aldrich, the birds were separated morphologically into two distinct groups. If the differences are so striking, perhaps the case for *Empidonax traillii alnorum* should be investigated more closely by the taxonomists. *Alnorum* was made synonymous with the nominate race in the last A.O.U. *Check-List* (1931, pp. 208 and 389).

As a further check on song differences, I sent a song-analysis questionnaire to a number of ornithologists in strategic geographical areas. Despite the courteous and generous response from this group, the results shed no light on whether or not there were two distinct song-areas within the range of the Alder Flycatcher. The questionnaire asked which of ten phonetic descriptions listed sounded most like the Alder Flycatcher song in the area with which the observer was most familiar. Space was also given for any new interpretations and attendant remarks. Twenty-nine ornithologists received the questionnaire. Twenty-seven answered it, but seven could offer no information. The remaining 20 indicated no clear-cut unanimity of opinion. For example, Robert Arbib circulated his questionnaire among members at a meeting of the Linnaean Society of New York City. The following interpretations resulted: *fitz-bew*, 11; *wee-bé-o*, 3; *greadeal*, 2; and *sweet-cheeuu*, 1. These data are from an eastern state in which *wee-bé-o* or *phe-bé-o* is said to be predominant (Peterson, *loc. cit.*). In seven instances the observer to whom a questionnaire was sent recorded two or more songs for the Alder Flycatcher, and in seven other cases an entirely new phonetic description was presented. These results, while not surprising, led me to think that the questionnaire measured the descriptive ability of the ornithologist rather than any regional difference in the song of the bird (a fault of the questionnaire).

In Wisconsin the Alder Flycatcher song is more than just *fitz-bew*. A prefix which sounds to me like *creet* precedes the *fitz-bew*. This note is sung just as loudly as the second part. When the birds are at the peak of their singing, the song is *creet* (pause) *fitz-bew*. Sometimes two *fitz-bews* are given in succession, following the *creet*. The only other author to suggest this *creet* as part of the full song is Trautman (1940: 296), who describes the song as *sweet-cheeuu*.

The song *re-péal* (Hyde, 1939: 155) or *grea-deal* (Miller, in Forbush, 1927: 355; Silloway, 1897: 106) is also sung by Wisconsin birds. In my experience this song was usually heard at a distance but seldom heard as described when the observer was close by, except when the bird was greatly excited. This could be coincidence, but I am inclined to believe it is a matter of phonetic distortion caused by distance between the observer and the singing bird.

In general, I believe this species may have two songs or even three, but our knowledge of the song is so limited that we cannot with certainty classify it as to geographic region, season, age classes, social behavior, and other factors that might alter its pattern.

The call note of the Alder Flycatcher is a half-chirped, half-whistled *wheet* which, although given rather sharply, is a clear, melodious note. There is virtually no difference of opinion or interpretation among ornithologists as to the sound of this call. During this study, my co-workers and I referred to the calling as "whipping". When excited, the Alder Flycatcher contracts the call note so that it sounds like *whip!* It is described by Bendire (1895: 310) as *huip*,

huip. "Whipping" usually precedes the onset of song in both morning and evening, and is the note that is most apt to call one's attention to the bird when the observer is approaching the nest.

Quite by accident during the summer of 1943 an entirely new singing performance of the Alder Flycatcher was observed, which to my knowledge has not been reported in the literature. One evening in early June while checking the late-season Woodcock (*Philohela minor*) *peenting* in a section of marsh adjacent to the Alder Flycatcher study area, I stopped at a listening post on the east edge. It was about 8:30 p.m. (C.S.T.); the sun had set and it was almost dark. After a few minutes the last Song Sparrows (*Melospiza melodia*), Meadowlarks (*Sturnella magna*), Long-billed Marsh Wrens (*Telmatodytes palustris*), Henslow's Sparrows (*Passerherbulus henslowii*), and Yellow-throats (*Geothlypis trichas*) stopped singing and the marsh was momentarily quiet. Presently, as if by signal, several Alder Flycatchers nearby began to call, then broke into full song. Like a wave the singing spread to all sections of the 200-acre marsh, where a short while before no Alder Flycatcher was singing. This in itself was spectacular. As I listened I could hear the call note, the jumbled song used when chasing (*weet-weet-whee—fitz-bew*, given rapidly), and the familiar territory song (*creet*—pause—*fitz-bew*). There was also a variation of the last song which appeared to be coming from a considerable distance above the highest (6–8 feet) bushes used as singing perches. Upon a series of subsequent visits I found this to be a *flight-song*, part of the normal breeding behavior. During the nesting seasons of 1943 through 1947, I studied this song and its accompanying flight in some detail.

The song-flight is preceded by a series of loud calls (*wheet-wheet*, etc.) which become shorter and follow each other more and more rapidly until it seems as though they could be given no faster. Then in the same rapid tempo the bird calls *creeet, fitz-bew* over and over, in all about 8 to 12 times. At about the time the calling becomes accelerated, the bird takes off from its song-perch and spirals skyward in an erratic zig-zag flight. The bird appears to be fluttering rather than flying, and reaches a height of from 30 to 50 feet above the marsh floor. At this point the singing stops and the bird dives silently down to the original singing perch or to a nearby bush, from which point it may continue to sing. In many instances the bird proceeds from the nearby bush to its original perch by silently flying back just over the top of the vegetation.

In Silloway's (1897: 109) sketch of the Alder Flycatcher he says of this bird's flight habits, "Even out under the clear dome, with the blue bending over them so invitingly, they never seek to rise above their accustomed limits, and their sallies from the weed tops and low bush-heaps are never far or high." This, it seems to me, illustrates that the word "never" is usually ill-chosen in describing bird behavior, and that this exception (the song-flight) to what Silloway thought inflexible behavior is all the more interesting.

The song-flight seldom carries a bird beyond its territorial boundaries and

usually covers less than 60 feet laterally. From a 25-foot tower placed in the center of the study area I made observations on the heights, distances covered, and song behavior of individual pairs. This tower facilitated complete coverage of the marsh, for at that height song-perch locations could not be confused. Also it made the estimation of heights of the song-flights more accurate and served as a blind for other behavior observations.

About 350 song-flights were heard by my co-workers and me during the study, but only 20% were actually seen. We found it impossible to tell which bird will go into a song-flight, or when it will occur, so one cannot always be in a position to see the flight. In many instances the evening song may begin or end with a song-flight. Song-flights on any one evening generally occur shortly after the birds begin their song period, although I have seen at least one song-flight by moonlight at the very end of an evening song period. A single bird may perform as many as six times during an evening, but two song-flights were more generally the rule. Also, not all birds perform song-flights on a given evening; in fact on certain evenings only the call is used by some birds. The reason for this interchange of expression is not known. In any one evening or morning less than 25% of the birds singing performed song-flights.

In southern Wisconsin, singing begins almost as soon as the birds arrive in spring, which is about May 10, and lasts until about August 10. The birds leave for the south shortly thereafter. Detailed studies of the song-flight in relation to certain environmental factors were made in 1944 and 1947. In general there was no correlation with any weather factor that was obvious in the field. The duration of song was used as the base datum for comparing with weather phenomena. There was no significant difference between the mean duration of song in the two years (1944, 37.0 $\pm$ 1.63 min.; 1947, 39.2 $\pm$ 2.76 min.). No correlation was found between duration of song and temperature at start of song, difference in barometric pressure between 12:30 and 6:30 p.m. on any one day, wind velocity and amount of available sunshine on any one day. However, when plotting the minimum temperature against duration of song, a statistically significant inverse correlation was realized (r value = -0.538). What ecological meaning this has, if any, is not clear, especially in view of the fact that minimum temperatures normally occur in the two hours before dawn of each day. This low point is then about 14 hours before evening song begins. The mean number of flight-songs which I heard per evening during the two years studied was 3.7 $\pm$ 2.3. The number of songs per day was not comparable because no consistent number of listening posts was used during the song periods. There was, however, a very definite correlation between the starting and stopping of song with the solstice (longest day), which will be discussed later.

I suspected that on cloudy evenings song might begin earlier and last longer, but the data did not support this suspicion. This much I can say: the two longest song periods in 1944 occurred on cloudy days. Purchon (1948: 149) found a

similar situation in song frequency of the European Barn Swallow (*Hirundo r. rustica*) in relation to weather. He states "Above a certain threshold it appears that weather had no effect on song frequency—the best day for song was one of the 5 worst days for weather." Cloudy days are no better than clear days for daytime singing; actually the most voluble daytime singing I have ever heard occurred on a clear day in bright sunlight.

Both in 1944 and in 1947 the last song period of the season was very short. This appeared to be an abrupt tapering off.

It was evident, after listening to Alder Flycatcher singing for several weeks, that there was a certain daily regularity about it. At the suggestion of the late Aldo Leopold, who had done considerable work (unpublished) on the relation of bird song to light intensity, I kept records of the beginning and cessation of song. To test this regularity, I plotted the time of song beginning and cessation against the sunset curve (Fig. 1). It is obvious by simple inspection that beginning of song follows the sunset curve. It is probably controlled by a light-intensity factor. This observation is not new. A number of writers have observed the same phenomenon, particularly Craig (1943: 92–93) who worked on a closely related species, the Wood Pewee (*Contopus virens*). In 1944 and in 1947 the time of song beginning followed the slope of the sunset curve downward from late June to early August. In 1944 it followed the upswing toward the solstice.

Certain individuals may occasionally "jump the gun," so that beginning of song as here used is taken to be the time at which singing becomes continuous in all sections of marsh under observation. Actually I experienced little difficulty in assigning a time to the start of song since the birds usually started together.

Song cessation is probably *not* directly controlled by a light factor because evening song usually ends after it is completely dark to the human eye, and probably to the eyes of flycatchers as well.

Evening civil twilight,[2] which ends when the center of the sun is 6° below the horizon, was also plotted in the above mentioned figures. In no case was song cessation recorded before the end of civil twilight in either year. Interesting also is the fact that in both years song always started before the end of civil twilight, but in only two instances in 28 did song begin before the onset of civil twilight, namely sunset (see Fig. 1).

Cessation of song may be caused by fatigue, as was also postulated by Haecker (1924: 724), Wright (1912: 327), and Craig (1943: 96) for other species. I believe, however, that if we accept the hypothesis that a given light intensity stimulates song, then that same stimulation must fade, irrespective of whether the bird is physically able to respond or not. What I measured here was in effect the onset of the stimulation, its result, and the time at which the response

[2] "If the sun is much lower ordinary outdoor, civil operations are impracticable without artificial light" (Nautical Almanac, 1941).

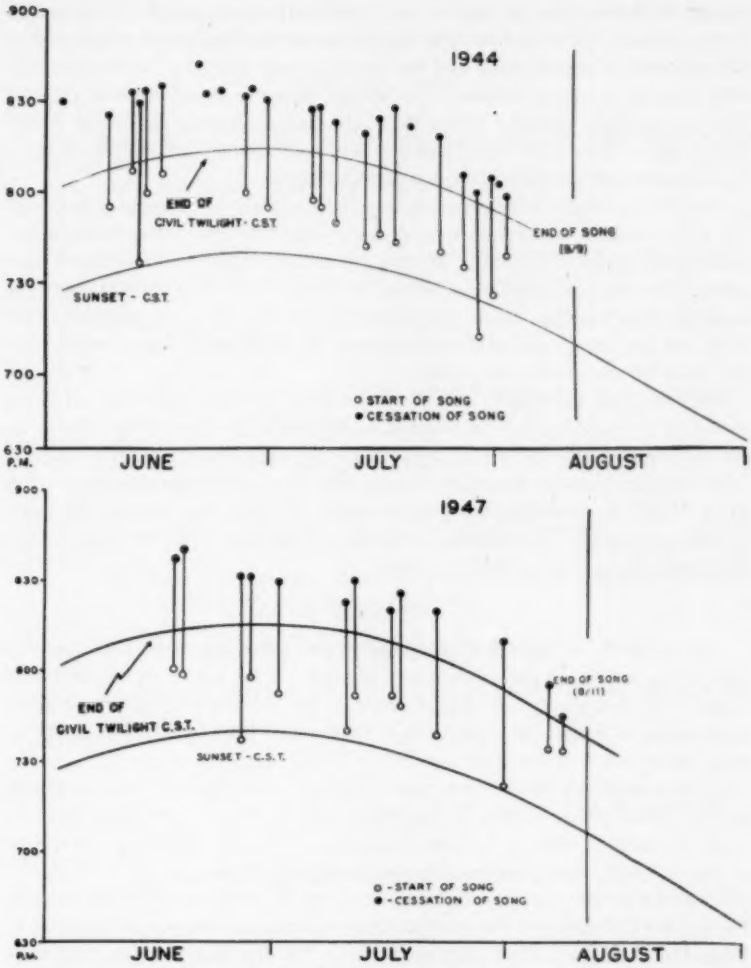

FIG. 1. Alder Flycatcher evening song in relation to sunset and the end of civil twilight in 1944 (above) and 1947.

was completely dissipated. Nothing in my observations suggested augmentation of the stimulus or acceleration of the response due to further changes in light intensity once the point of active response is reached. Craig (1943: 101) states of the Wood Pewee: "It may be that the ending of the song is influenced by a change in illumination." In the case of the Alder Flycatcher there is no visible

change in illumination during the last third of the song period since it occurs in the darkness after civil twilight. Furthermore the evening song of the Alder Flycatcher in a marsh starts and reaches maximum intensity rather abruptly, and stops in the same fashion. This abrupt response would seem to indicate that a given light intensity rather than "changes of illumination" is the stimulating agent. What that light intensity is in foot-candles or how it is modified by environmental factors I am not prepared to say.

Craig (*op. cit.*) also infers that intraspecific stimulation to song may not occur (p. 101). I am of the opinion that an individual bird may cause others in adjoining territories to continue in song when they might normally have been quiet. This was particularly evident at the close of the song period on any one evening. In numerous cases the persistent bird "coaxed" its neighbors into song and the group continued their roundelay for three to five minutes after the bulk of the marsh was silent.

The song and song-flights also occurred during the crepuscular period in the morning, but a seven-day trial period of investigation showed that there was less activity at that time (i.e., fewer birds in song, fewer song-flights, etc.). There was no clear-cut cessation of song, as singles and groups of two and three birds would occasionally sing intermittently late into the morning. It is interesting, however, that seasonal song stopped within a two-day period both evening and morning in 1944 and 1947.

Summary

The existence of two distinct songs of the Alder Flycatcher, one eastern (*phe-bé-o*), and the other midwestern (*fitz-bew*), is beclouded by the fact that there is no unanimity of opinion among ornithologists on this geographic segregation of song. The disagreement may result from factors human rather than avian.

In Wisconsin the Alder Flycatcher appears to have added an extra syllable to the *fitz-bew* song, making it *creet* (pause) *fitz-bew*. Phonetic descriptions of Alder Flycatcher song by various writers are listed. The phonetic description of the call note, *wheet*, is generally accepted by ornithologists.

This bird performs a song-flight which carries it 30–50 feet above the marsh. During the performance the *creet, fitz-bew* is repeated in rapid succession 8–12 times. This song and flight take place late in the day and continue until after dark. Song generally starts after sunset, and the time of starting and stopping varies in direct relation to the time of sunset. The onset of daily song is probably controlled by a light-intensity factor; cessation probably is not, inasmuch as it is totally dark (after civil twilight) when the singing stops.

No correlation was found between measurable weather conditions and recorded aspects of song.

Morning song also occurs but it is less vigorous and less regular. In 1944 and

1947 seasonal song was ended both in the morning and in the evening within a two-day period (August 9, 1944 and August 11, 1947).

Literature Cited

Bailey, F. M.
1908 Handbook of birds of the western United States. Houghton Mifflin Co., Boston.

Barrows, W. B.
1912 Michigan bird life. *Special Bull., Dept. Zool. and Physiol. Mich. Agric. Coll.*, Lansing.

Bendire, C.
1895 Life histories of North American birds with special reference to their breeding habits and eggs. *Special Bull. U. S. Natl. Mus.* 2., Washington, D. C.

Bent, A. C.
1942 Life histories of North American flycatchers, larks, swallows and their allies. *U. S. Natl. Mus. Bull.* 179.

Butler, A. W.
1897 The birds of Indiana. Twenty-second annual report, Indiana Dept. Geology and Natural Resources, Indianapolis.

Chapman, F. M.
1937 Handbook of birds of eastern North America. D. Appleton-Century Co., New York City.

Coues, E.
1903 Key to North American birds. Vol. 1. The Page Co., Boston.

Craig, W.
1943 The song of the Wood Pewee, *Myiochanes virens* Linnaeus: A study of bird music. *New York State Museum Bull. No.* 334, Albany.

Forbush, E. H.
1927 Birds of Massachusetts. Vol. 2. Mass. State Dept. of Agric., Boston.

Haecker, V.
1924 Reizphysiologischer über den Abendgesang der Vögel. *Arch. ges. Physiol.*, 204: 718–725.

Hausman, L. A.
1946 Field book of eastern birds. G. P. Putnam's Sons, New York City.

Hoffmann, R.
1904 A guide to the birds of New England and eastern New York. Houghton Mifflin Co., Boston.

Howell, A. H.
1932 Florida bird life. Coward-McCann, Inc., New York City.

Hyde, A. S.
1939 The ecology and economics of the birds along the northern boundary of New York State. *Roosevelt Wildl. Bull.* Vol. 7, No. 2.

Nice, M. M.
1931 The birds of Oklahoma. Revised Edition. University of Oklahoma Press, Norman.

Peterson, R. T.
1947 A field guide to the birds. Houghton Mifflin Co., Boston.

Purchon, R. D.
1948 The nesting activities of the swallow. *Proc. Zool. Soc. London*, 118: 146–170.

Roberts, T. S.
1932 The birds of Minnesota. Vol. 2. Univ. of Minnesota Press, Minneapolis.

Saunders, A. A.
1935 A guide to bird songs. Appleton-Century Co., New York City.

SILLOWAY, P. M.
1897 Sketches of some common birds. Editor Publishing Co., Cincinnati.
TODD, W. E. C.
1940 Birds of western Pennsylvania. University of Pittsburgh, Pittsburgh.
TRAUTMAN, M. B.
1940 The birds of Buckeye Lake, Ohio. *Univ. Mich. Mus. Zool. Misc. Publ.* 44.
WRIGHT, H. W.
1912 Morning awakening and even-song. *Auk*, 29: 307–327.

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Reuben Myron Strong was born in West Allis, Wisconsin, in 1872. Graduated from Oberlin College in 1897, he later received A.M. and Ph.D. degrees from Harvard. He was a member of the Department of Zoology at the University of Chicago from 1903 to 1914 and served as Chairman of the Department of Anatomy at Loyola University Medical School from 1918 until his retirement in 1946. Since that time he has been Research Associate in Anatomy at the Chicago Natural History Museum.

Dr. Strong was the first Treasurer of The Wilson Ornithological Club; was Vice-President from 1894 to 1901; and President from 1920 to 1921. He became an Associate of the American Ornithologists' Union in 1889, a Fellow in 1949. He has published extensively on animal coloration, genetics, neurology, ossification of the skeleton, comparative anatomy and bird behavior. He is, however, best known for his "A Bibliography of Birds," a three-volume work on the ornithological literature of over twenty languages.

In a recent letter he wrote: "I have kept well and have been out every day for work. I have had a good deal of skating, which the cold weather has made possible." Of such stuff are Founders made!

THE SONG OF THE SONG SPARROW

BY ARETAS A. SAUNDERS

THE songs of oscine birds vary greatly. No two individual birds sing in exactly the same way, and the songs of any given individual bird vary (Saunders, 1924). These two sorts of variation are more obvious in the Song Sparrow, *Melospiza melodia*, than in any other bird I have had opportunity to study.

To date my collection of records of Song Sparrow songs numbers 884, no two of which are exactly alike. The songs were recorded by my 'graphic method' (Saunders, 1915, 1929, 1938). The records are mainly from Connecticut and New York. A few from the vicinity of Columbus, Ohio, include those of certain individuals studied at Interpont by Mrs. Nice (1937, 1943).

Length of song. The 884 recorded songs varied in duration from 1.8 to 5.2 seconds, the average being 2.7 seconds. The shortest and longest songs were exceptional, the latter being a flight-song (Fig. 1). If we disregard one short song of 1.8 seconds duration and three unusually long songs (respectively of 4, 5, and 5.2 seconds) the remaining 880 songs varied from 2.2 to 3.2 seconds in length, and 81% of these were from 2.6 to 3 seconds in length. Of the 884 songs, 265 were 2.8 seconds long.

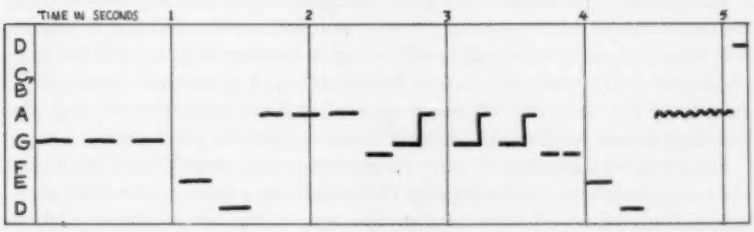

FIG. 1. Graphic record of an exceptionally long Song Sparrow song. This song was a flight-song. Fairfield, Connecticut, March 21, 1925.

Song Sparrow songs are usually rhythmic. The accented, obviously *beat-out* introductory notes are followed by notes each equal in time to one of the introductory notes, or exactly twice as fast, and trills are frequently just two or three times the length of one introductory note. A few rhythms are exceptional, as, for example, that produced in two exactly equal periods of time, one by five notes, the other by seven. Occasionally a song seems to have no rhythm at all except in the introductory part.

Pitch. In former papers on bird songs I have used such symbols as C''' and C'''' to indicate the different octaves. Brand (1935) used a better method, namely, C for the lowest C on the piano; and C_1, C_2, etc., for notes respectively one, two and more octaves higher, C_7 being the highest. In my method C meant middle C on the piano, C'''' the highest C. In this paper I am using Brand's method.

Brand (1935: 49–50) studied three Song Sparrow song-records made by sound photography on film, finding therein numerous short notes which were inaudible to the human ear and exceedingly high in pitch. From his later study of four recordings (1938: 267) he concluded that the vibration-frequencies of Song Sparrow songs varied from 1900 to 7700 per second. This is practically a two-octave range, from about A_5 to A_7. The four recordings under discussion were evidently made from three individual birds. My own records have been limited to notes that the human ear could hear, of course. The 884 records—of about 685 individual birds—display a range in pitch from D_5 to F_7 (1150 to 5450 vibrations), though the great majority of them range only from A_5 to D_7 (1900 to 4600 vibrations). I did not record pitches as high as those found by Brand, probably because the highest-pitched notes were so very short that I did not hear them. I have heard and recorded songs (of other bird species) ranging higher than 7700 vibrations, but these high notes were sustained. From my experience I conclude that it is exceedingly rare for a Song Sparrow to sing a note pitched higher than D_7—that is, long enough for the human ear to hear it.

In recording bird songs in the field, taking down the relative pitches of the notes and the pitch-intervals between one note and another is a simple matter; but taking the exact pitch, as heard by ear, is another step that I did not always have time to complete. In only 445 records did I ascertain the exact pitch. In none of the remaining 439 songs was the pitch unusually high or unusually low: had it been so, I would certainly have recorded the exact pitch.

Song Sparrows usually are quite accurate in pitch; that is, they use definite tones and half-tones in their singing. Occasionally one encounters a bird whose singing includes an off-pitch note or two. See, in this connection, the fourth note of record No. 14 (Fig. 2). Here the bird used approximately a quarter-tone.

An average Song Sparrow song ranges through a little more than $3\frac{1}{2}$ tones. The greatest range I have recorded for a single song is $7\frac{1}{2}$ tones, the least for a whole song, 1 tone. According to my records far more Song Sparrows have, oddly enough, a range of $2\frac{1}{2}$, $3\frac{1}{2}$, 4, or $4\frac{1}{2}$ tones than have a range of 2 or 3 tones. Of the 884 songs I recorded, 1 (only) had a range of but 1 tone; 5 had a range of $1\frac{1}{2}$ tones; 35 had a range of 2 tones; 149 had a range of $2\frac{1}{2}$ tones; 38 had a range of 3 tones; 304 had a range of $3\frac{1}{2}$ tones; 106 had a range of 4 tones; 132 had a range of $4\frac{1}{2}$ tones; 64 had a range of 5 tones; 15 had a range of $5\frac{1}{2}$ tones; 32 had a range of 6 tones; and 1 each had a range of $6\frac{1}{2}$, 7, and $7\frac{1}{2}$ tones.

To a musician the significance of the above-mentioned figures will be apparent. For those whose knowledge of music is not so great, the following explanation may be welcome. All of the simpler, better known melodies in human music, if played on the piano in the key of C, will fall almost entirely on the white notes; or if played in any key, they will fall mainly on the notes of the diatonic scale, *do*, *re*, *mi*, etc. Now the interval of two tones, if spaced from each white note in an octave on the piano, will fall on another white note 3 times out of 7, or 43% of the time. The interval of 2½ tones will fall on another white note 6 times out of 7, or 86% of the time. Similarly the other intervals: of 3 tones, 29%; 3½ tones, 86%; 4 tones, 43%; 4½ tones, 47%; 5 tones, 71%; 5½ tones, 29%; and 6 tones, 100%. Compare these figures with the number of Song Sparrow songs having these intervals in the paragraph above. If we allow for the fact that the average song has a range of 3½ tones, and that songs with greater range must be fewer in number, the figures reveal that the Song Sparrow's standard of pitch is similar to that of man; that those intervals which are harder for man to sing are less often used by the Song Sparrow; that the bird uses such intervals as fourths, fifths, and octaves—intervals that are natural, because based on mathematical relationships between the numbers of vibrations: in short that the Song Sparrow sings mainly on the notes of the human diatonic scale.

This is true of most song birds, a fact which has been discussed before by others, notably Clark (1879). It indicates that, in such birds, something more than defending a territory or advertising for a mate must have had a part in song evolution (Saunders, 1929: 125–130). It is because of this that, now and then, we meet with a bird that sings something like a bit of human music. The pitch is higher, the quality is different, but the time and pitch-intervals are the same. For example, the first six notes of song No. 18 (Fig. 2) are identical in pitch-interval and time with certain notes of a song that was popular many years ago. The words that fit the notes are " . . . Reuben, I've been thinking."

Intensity. The intensity of Song Sparrow song does not vary greatly. Certain songs contain one or more high-pitched, strongly accented notes like the terminal notes of Nos. 10 and 13 (Fig. 2). Other songs contain one or two introductory or terminal notes that are of low intensity and audible only for a short distance. I have made no attempt to measure the intensity of Song Sparrow song. The distance a bird note (or any sound, for that matter) carries is not, necessarily, a measure of its intensity. Variation in intensity can be measured when the notes are of the same quality and pitch, as they are in many songs of the Field Sparrow (*Spizella pusilla*), a species whose song-intensity I have reported on (Saunders, 1922). The high-pitched, though seemingly faint notes of many birds carry farther than low-pitched notes which are obviously louder. Pitch and quality, as well as intensity or volume, determine the distance a sound carries. Overtones may cut down the distance, and since overtones are often

low, sounds of low pitch and unclear quality do not carry well. Balloonists tell us that the last sounds they hear from the earth below them as they rise are the high-pitched cries of little children.

Quality. Song Sparrow songs are extremely variable in quality. Average songs are sweetly whistled, but some songs are, as a whole, squeaky, husky, buzz-like or rattle-like, and occasional notes in otherwise 'sweet' songs may be of this sort. To me the quality of the Song Sparrow's song is more variable than that of any other common North American species of the family Fringillidae.

Consonant Sounds. Consonant sounds are not very noticeable in the Song Sparrow's song. Those that occur are explosives, suggesting the letter *t*, or sibilants such as the letter *s*. Individual songs vary greatly in this respect (Nice, 1943: 116).

The Song and its Component Parts

The Song Sparrow song has been described as "short introductory notes, a central trill, and a flourish of notes and slurs at the end" (Wheeler and Nichols, 1924: 445). I would change this description by substituting "two-note phrases" for "slurs." True slurs, in my experience, are rare in Song Sparrow songs, whereas two-note phrases are exceedingly common. Songs Nos. 4 and 17 (Fig. 2) are normal songs containing a *slurred* note each. By a "two-note phrase" I mean a phrase composed of two notes closely connected but of abruptly different pitch. The last two notes of song No. 12 (Fig. 2) is an example. In a *slur* the change of pitch is gradual. A two-note phrase, for example, might sound like "teeto," whereas a corresponding slur would sound like "teeyo."

Introductory notes. These vary in number from 1 to 7 (average: 2.7). They are all short and staccato, of the same pitch, equal in time, and separated by short pauses. They may be sung slowly, at a rate of 3 per 1.2 seconds, or rapidly, at a rate of 3 per .4 of a second. The slower time is commoner.

While these introductory notes are usually as I have described them, I have on occasion heard a song in which each introductory note is actually a two-note phrase with one note shorter than the other. The short extra note may either precede or follow the main note, and it may be of either lower or higher pitch. Each of these four conditions is illustrated, respectively, in songs Nos. 7, 8, 15 and 17 (Fig. 2). I have 77 records of songs with introductory notes of this sort. In 48 of these the extra note followed the main note (25 at higher pitch, 23 at lower pitch). In 29 the short note preceded (26 at lower pitch, 3 at higher pitch).

Central Trill. Most Song Sparrow songs contain, somewhere in the central portion, sometimes at the end, either a trilled note or a series of rapidly repeated notes all on the same pitch. Trills and rapidly repeated notes are essentially the same phenomenon, the difference being merely that in the trill the notes are too rapid for the ear to count. In my records all these rapidly re-

peated notes are called trills. Of the 884 songs, 55 had no trill, 580 had one trill, 259 had two trills, 9 had three trills, and 1 had four trills. The average had 1.3 trills. Trills are normally sustained on one pitch, but in one song (Fig. 2, No. 11) the trill gradually dropped a full tone.

Remainder of the Song. The terminal flourish of notes and two-note phrases is extremely variable. A given bird may sing the same song over and over, all parts being the same each time except for the last few notes. These final notes may be varied by additions, omissions, or changes in pitch. In recording such songs in the field I encircle notes that are variable or sometimes omitted. Often I am obliged to make records of the two or three different endings in this way. Especially is this true of my recording of Song Sparrow songs. The last note of No. 9 (Fig. 2) is an 'encircled note.'

Types of Songs

When one has a large number of records of the songs of one species it is necessary to file them so that similar songs can be kept together for comparison. I have divided my Song Sparrow songs into types based on the way they begin. In some cases I have found it useful to subdivide further. Wheeler and Nichols (1924) divided songs into two groups. When I tried classifying my records in this way, altogether too many normal songs belonged to neither group; but when I divided them into five groups all but eight could be placed, and three of these eight were primitive or juvenile songs.

The type to which a given song belongs is determined by the relation in pitch of the introductory notes to the trill and by the position of the trill (or in the case of more than one trill, by that of the first trill). A key to these types is as follows:

Introductory notes followed immediately by trill.

Introductory notes and trill on the same pitch. Type 1 (Nos. 1–3, Fig. 2. This is Group B of Wheeler and Nichols).

Trill higher in pitch than introductory notes. Type 2 (Nos. 4–8, Fig. 2. This is Group A of Wheeler and Nichols).

Trill lower in pitch than introductory notes. Type 3 (Nos. 9–11, Fig. 2).

Introductory notes separated from trill by one or more notes.

Introductory notes and trill separated by single note which is on a different pitch from either. Type 4 (Nos. 12–14, Fig. 2).

Introductory notes and trill separated by two or more notes, the first on different pitch from that of the introductory notes. Type 5 (Nos. 15–18, Fig. 2).

Of the 884 recorded songs, 159 (18%) were of Type 1, 191 (21.6%) of Type 2, 144 (16.4%) of Type 3, 137 (15.4%) of Type 4, 245 (27.7%) of Type 5, and 8 (0.9%) irregular.

In certain respects Type 1 is quite different from the others. In Type 1 two introductory notes (rather than three) are the rule. In Type 1 the trill is usually

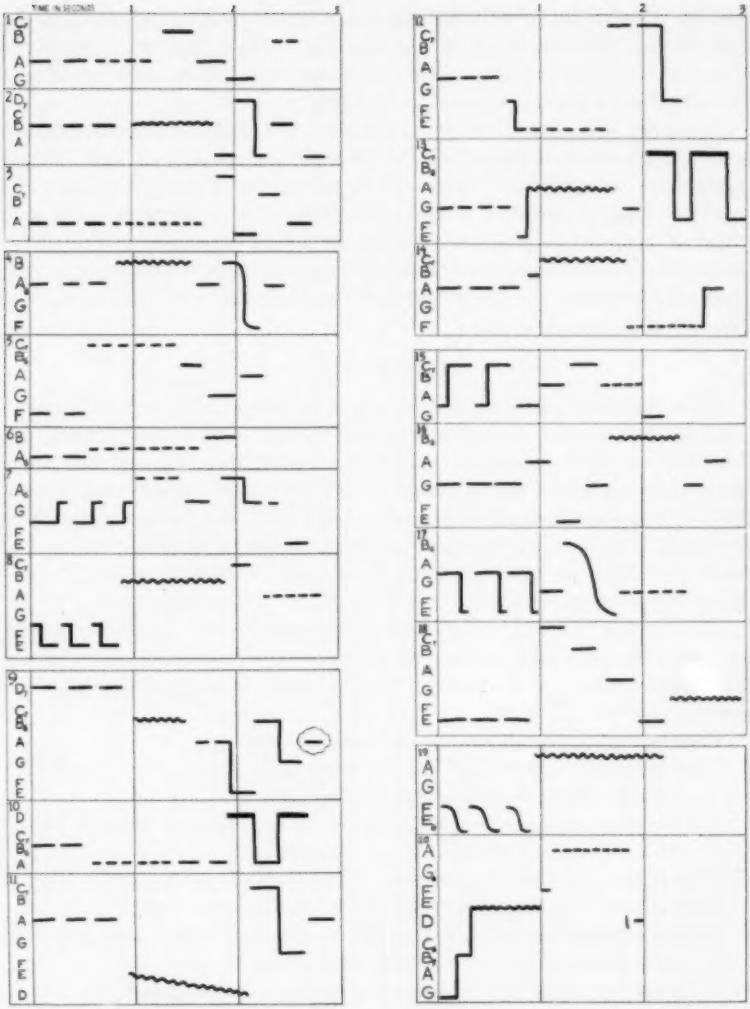

FIG. 2. Graphic records of Song Sparrow songs. 1. March 25, 1922. 2. June 9, 1921. 3. March 4, 1922. 4. July 16, 1921. 5. April 10, 1921. 6. April 11, 1923. 7. July 19, 1923. 8. June 27, 1921. 9. June 14, 1921. 10. March 25, 1922. 11. April 15, 1914. 12. October 24, 1922. 13. May 29, 1921. 14. February 25, 1922. 15. July 2, 1922. 16. August 10, 1921. 17. July 6, 1921. 18. July 22, 1922. 19. July 5, 1920. 20. March 22, 1943. All recorded at Fairfield, Connecticut except 4 and 17 (Quaker Bridge, New York); 7 (Savannah, New York); 11 (West Haven, Connecticut); 12 (Bridgeport, Connecticut); 13 (Norwalk, Connecticut); and 15 and 18 (Syracuse, New York). For a discussion of the types of songs these represent see p. 103).

not a true one (as it is in other types), but a series of rapid notes. An average Type 1 song opens with two notes which are followed by a series of rapid notes, and in a good many cases these rapid notes are just twice as fast as the introductory ones.

Type 4 songs may be further divided into 8 subtypes on the basis of the relative pitches of the introductory notes (which are all on one pitch), the single note between them and the trill, and the trill itself (which is almost invariably on the same pitch throughout). If we call the highest pitch 1, the medium pitch 2, and the lowest pitch 3, there are these six possible arrangements: 1-2-3, 1-3-2, 2-1-3, 2-3-1, 3-1-2, and 3-2-1. There are also two other arrangements in which there are only two pitches, 1-2-1 and 2-1-2, but there seem to be very few songs of these sorts. Of the 137 Type 4 songs, 9 had the 1-2-3 pitch-arrangement of introductory notes, single note, and trill; 35 the 1-3-2 arrangement, 19 the 2-1-3, 39 the 2-3-1, 16 the 3-1-2, 17 the 3-2-1, one the 1-2-1, and one the 2-1-2. Nos. 12–14 are examples of subtypes 4a, 4d, and 4f respectively. In 25 of my records of Type 4 songs, the note between the introductory notes and the trill is very short and connected with the trill, as in No. 13.

Type 5 songs are also divisible into 8 subtypes on the basis of the relative pitch of the introductory notes and the *two* notes immediately following them. Of the 245 songs of Type 5, 22 had a 1-2-3 (high-medium-low pitch) arrangement, 65 a 1-3-2 arrangement, 49 a 2-1-3, 37 a 2-3-1, 17 a 3-1-2, 32 a 3-2-1, 12 a 1-2-1 and 11 a 2-1-2. Note that the last two arrangements (two pitches only) again are less frequently used than the others. Songs 15–18 are examples of subtypes 5b, 5c, 5d, and 5e respectively. In 45 of my Type 5 songs three introductory notes are followed by three other notes in the same time but on different pitches (see Fig. 2, Nos. 16 and 18). Such songs are especially pleasing musically. Two songs of this sort I have diagrammed in a previous paper (Saunders, 1924: 249, Nos. 1 and 2).

Of eight 'irregular' songs that cannot be put into types, three were primitive or juvenile songs (Fig. 3); one began with a trill; three had two sets of introductory notes on different pitches; and one began with four very short notes each on a different pitch. In this last song the introduction was followed by *three* trills. The whole song was of such an unusual quality that I did not definitely know it was a Song Sparrow's until I saw the singer. In my notes I described the song as a husky squeaking suggestive of the twittering of a Cliff Swallow (*Petrochelidon pyrrhonota*).

Local Variation. Occasionally one finds a peculiarity in Song Sparrow song that is common to several individuals in a restricted locality. I have previously stated that slurs are rare in Song Sparrow songs. I have 22 records of normal songs that contain downward slurred notes. Three are from Connecticut, three from scattered localities in central New York, and 16 from Quaker Bridge, Cattaraugus County, New York. Nos. 4 and 17 are examples. The birds that

sang slurs of this sort all lived along the Allegheny River within half a mile of the Quaker Bridge railroad station. I have recorded many Song Sparrow songs from regions nearby, particularly in Allegany State Park, but noted no slurs in them. The occurrence of this "Quaker Bridge slur" is the best example I have of local variation in Song Sparrow song.

Geographical Variation. My Song Sparrow records represent three main geographical areas: (1) an eastern—Connecticut and southeastern New York, (2) a central—central New York, and (3) a western—southwestern New York. I have a few records from the Adirondacks and a few from Columbus, Ohio, but these samples are so small that it would be unwise to draw any conclusions from them. All five types of songs are sung by the Song Sparrows of the three above-mentioned areas. Of 514 eastern area songs 77 (15%) were of Type 1, 98 (19%) of Type 2, 103 (20%) of Type 3, 67 (13%) of Type 4, and 169 (33%) of Type 5. Of 167 central area songs 20 (12%) were of Type 1, 50 (30%) of Type 2, 24 (15%) of Type 3, 33 (19%) of Type 4, and 40 (24%) of Type 5. Of 186 western area songs 35 (19%) were of Type 1, 54 (29%) of Type 2, 21 (12%) of Type 3, 20 (10%) of Type 4, and 56 (30%) of Type 5. Nothing about these figures reveals any marked correlation between type of song and geographical area.

There is some evidence of geographical variation in the introductory notes of New York and Connecticut songs. In certain songs the main introductory notes are accompanied by shorter notes on a different pitch. Soon after I began recording Song Sparrow songs in the western area (Cattaraugus County, New York), I noticed that this type of introductory note was more common there than it had been in the eastern area (Connecticut and far eastern New York). Of a total of 514 songs recorded in the eastern area only 12 (2.4%) had had double introductory notes; of 167 songs in the central area 33 (19.8%) had had double introductory notes; and of 186 songs in the western area 32 (17.2%) had double introductory notes. Songs of the central and western areas were, in other words, somewhat alike, and together they differed from songs of the eastern area. This is indeed interesting because Song Sparrows of the eastern area belong to the subspecies *melodia;* those of the western area are of the subspecies *euphonia;* and those of the central area (Onondaga, Cayuga and Wayne Counties, New York), though intermediate between these two races, are "more nearly related to those of western New York than to those of the eastern part of the state" (personal letter of December 11, 1950, from Kenneth C. Parkes to George M. Sutton). My song-data presented above are surprisingly corroboratory of this concept.

Each individual male Song Sparrow sings a number of different songs. The number per individual varies from six to 24 (Nice, 1943: 116–117). What I have previously written on this subject (1924, 1938) was included in Mrs. Nice's figures. Since then I have added further data and now have records of 13

TABLE 1

174 Different Songs Sung by 13 Song Sparrows

Bird No.	Song-type					Total number different songs
	1	2	3	4	5	
1	2	0	1	0	3	6
2	2	0	2	0	4	8
3	0	1	0	3	5	9
4	2	0	1	0	6	9
5	0	5	1	0	5	11
6	0	2	1	2	7	12
7	2	0	3	3	4	12
8	0	3	7	2	3	15
9	1	3	1	1	10	16
10	2	3	2	1	8	16
11	3	3	3	0	9	18
12	0	2	4	3	9	18
13	0	5	6	1	12	24
Totals	14	27	32	16	85	174

individuals. The number of songs per individual still ranges from six to 24. Table 1 shows the number of different songs (and song-types) 13 individual birds sang. Each individual bird sang at least three song-types, several sang four, and two sang all five. Only seven sang Type 1; eight sang Type 4; but every individual sang Type 5, and all but one sang Type 5 as often as, or oftener than, any other type.

I have recorded a flight-song (Fig. 1) which was distinctly longer than other songs. It did not, however, begin with "tit-tit-tit" notes (Nice, 1943: 118). I have heard Song Sparrow flight-songs which began in this way and it is interesting to observe that flight-songs with such a beginning are common to a number of other species, the Phoebe (*Sayornis phoebe*) and Yellow-throat (*Geothlypis trichas*), for example.

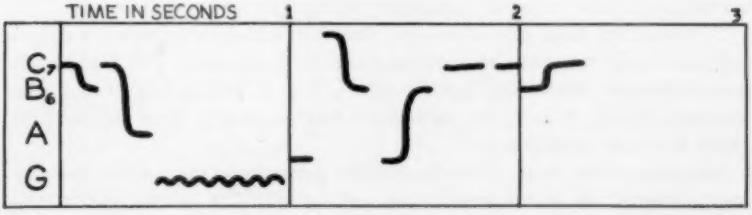

Fig. 3. Graphic record of a 'primitive' Song Sparrow song. Fairfield, Connecticut, September 20, 1924.

Figure 3 is a record of a primitive song. My three records of primitive songs are not much alike and there is nothing definite by which to distinguish them from primitive songs of other species. The notes are usually rapid but not loud.

Imitation. When one finds two Song Sparrows whose songs are nearly alike, the birds are apt to be singing within hearing of each other. In the spring migration, when the roadsides are full of singing Song Sparrows, one may often find two or three birds each beginning its song in the same manner and on the same pitch. But rarely do two such birds end their songs in the same way.

I presume that almost any oscine bird may, at times, do some imitating of the songs of other species. I have one record of a Song Sparrow song (No. 19, Fig. 2) which was much like that of a Field Sparrow, the introductory notes being downward slurs and the rest of the song a long, high-pitched trill. When I first heard this song I was doubtful about the species of bird that produced it. The quality was not quite so clear and sweet as that of a Field Sparrow, yet I did not expect it to be a Song Sparrow.

The last record of a Song Sparrow song (No. 20, Fig. 2) that I have recorded was rather astonishing, for the first 3 notes of the song were a perfect "*conqueree*" of the Red-wing (*Agelaius phoeniceus*). When I first heard this I thought two different birds were singing, first a Red-wing and then a Song Sparrow, but when I drew nearer it was clear that it all came from one bird, a Song Sparrow. So far as my ear could determine, the imitation was perfect. The pitch of the trill on E_6 was exactly right, for at least nine out of ten Red-wings sing it on that pitch.

Summary

From a study of 884 records of the Song Sparrow's song the following facts are determined. Songs vary from 1.2 to 5.2 seconds in length, averaging 2.7 seconds. Pitch varies from D_5 to F_7 (1150 to 5450 vibrations) in notes that are audible to the human ear. Single songs range from 1 to $7\frac{1}{2}$ tones in pitch, averaging $3\frac{1}{2}$ tones. The bird commonly uses pitch-intervals similar to those used in human music. There is little variation in intensity, but some high-pitched notes are loud and strongly accented and carry well. Quality is usually sweet and musical, but quite variable. Consonant sounds are not very noticeable.

The song has three parts: strongly rhythmic introductory notes, a central trill, and a final series of rather irregular and indefinite notes. The introductory notes may vary from 1 to 7 but are usually 2 or 3. Trilling is part of a great majority of songs. Commonly there is one trill, frequently there are two trills, rarely there are three or four.

Songs are of five types. These types differ primarily in the position and relative pitches of the introductory notes and the trill. The percentages of these types vary somewhat geographically. Song Sparrows of the seacoast region of Connecticut and southeastern New York sing a song the introductory notes of

which are usually single; some individuals in central and western New York sing a song whose introductory notes are double.

An individual Song Sparrow sings from six to 24 different songs. It may sing from three to all five types of songs. Two individuals singing near each other sometimes sing songs which sound alike. Especially is this true of the introductory parts. Rarely does a singing Song Sparrow imitate any other species of bird.

Literature Cited

Brand, Albert R.
1935 A method for the intensive study of bird song. *Auk*, 52: 40–52.
1938 Vibration frequencies of passerine bird song. *Auk*, 55: 263–268.
Clark, Xenos
1879 Animal music. Its nature and origin. *Amer. Nat.*, 13: 209–223.
Nice, Margaret M.
1937 Studies in the life history of the Song Sparrow, I. *Trans. Linn. Soc. N. Y.*, 4.
1943 Studies in the life history of the Song Sparrow, II. *Trans. Linn. Soc. N. Y.*, 6.
Saunders, Aretas A.
1915 Suggestions for better methods for recording and studying bird songs. *Auk*, 32: 173–183.
1922 The sopg of the Field Sparrow. *Auk*, 39: 386–399.
1924 Recognizing individual birds by song. *Auk*, 41: 242–259.
1929 Bird song. New York State Mus. Handb. No. 7.
1935 A guide to bird songs. D. Appleton-Century Co., Inc., New York City.
1938 Studies of breeding birds in the Allegany State Park, New York. *N. Y. State Museum Bull. No.* 318.
Wheeler, W. C. and Nichols, J. T.
1924 The song of the Song Sparrow. *Auk*, 61: 444–451.

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GENERAL NOTES

Gray Heron chased by Common Gull.—On June 23, 1949, at Foerde, Norway (Lat. 61½° N.), "I saw a gull, presumably a Common Gull (*Larus canus*), because that appears to be the common species here—though some may be Herring Gulls (*L. argentatus*)—chasing and harrying a Gray Heron (*Ardea cinerea*) which flew over the valley at about 1000 feet. I was surprised to see the gull harrying it."

The above quotation from my diary is submitted in view of the note by Thomas A. Imhof in the December, 1950, issue of *The Wilson Bulletin* (p. 210), reporting the chasing of a Great Blue Heron (*Ardea herodias*) by a Ring-billed Gull (*Larus delawarensis*) on March 6, 1950, in Alabama.

Note that the Gray Heron is the Old World analog of the Great Blue Heron, and the Common Gull, to some extent at least, that of the Ring-bill.—F. W. Preston, *Box 149, Butler, Pennsylvania.*

The genus *Plegadis* in Ohio.—Donald J. Borror, in his "A Check List of the Birds of Ohio, with the Migration Dates for the Birds of Central Ohio" (1950. *Ohio Jour. Sci.*, 50: 2), lists the Eastern Glossy Ibis, *Plegadis f. falcinellus*, mentioning three occurrences for northern Ohio and one for southern Ohio. The earliest of the four records is that of Jared P. Kirtland, who reported two individuals seen in 1848 near Fairport, in Lake County. One of these, an adult male, was shot by a Mr. Prugen and sent to Kirtland, who wrote (1850. *Family Visitor*, 1: 164): "It was duly skinned and mounted, and may now be seen standing along side of a Scarlet Ibis, from the banks of the Amazon, . . . in the cabinet of Nat. Hist. at the Cleve. Med. Coll." On the strength of this statement Wheaton (1882. "Report on the Birds of Ohio," *Geol. Surv. Ohio*, IV, *Section* 2, p. 498), Jones (1903. "The Birds of Ohio," *Ohio State Acad. Sci., Special Papers No. 6*, p. 216) and Dawson (1903. "The Birds of Ohio," p. 481) all listed the Eastern Glossy Ibis.

The Kirtland collection, including the Prugen specimen of *Plegadis*, was given to Western Reserve University. It is now in the Biology Building of that institution. Hoping to learn more about the Prugen specimen, I wrote the late J. Paul Visscher concerning it. Visscher replied that the collection contained two ibises—a White-faced Glossy Ibis (*Plegadis mexicana*) and a Scarlet Ibis (*Guara rubra*). Visscher's untimely death prevented my receiving further information concerning the specimens at that time.

Recently I wrote Harry C. Oberholser about the moot *Plegadis* specimen. On September 22, 1950, Dr. Oberholser replied: "I found the Ibises about which you inquired. The Scarlet Ibis is there, with one White-faced Glossy Ibis. There are no data . . . regarding either, but I agree . . . that the latter is without much doubt the bird concerning which Dr. Kirtland wrote. In this specimen the white forehead is not very conspicuous but still present; and one not familiar with the differences between the two species might easily call this specimen the Eastern Glossy Ibis."

The White-faced Glossy Ibis must, therefore, be added to the Ohio list.

The second and third *Plegadis* records for Ohio were sight records. On May 30, 1943, Harold F. Mayfield and Louis W. Campbell saw three adults in a flooded field adjoining the Cedar Point Marshes, in Jerusalem Township, Lucas County, near Toledo. "The birds were viewed at close range and carefully distinguished from the White-faced Glossy Ibis . . ." (Campbell, 1944. *Auk*, 61: 471). On June 22, 1947, in the same general area, Laurel Van Camp, state game protector for Ottawa County, saw an adult ibis which he identified as an 'Eastern Glossy' (Mayfield, 1947. *Aud. Field Notes*, 1: 176–177).

Details concerning the fourth Ohio *Plegadis* record follow: On October 1, 1949, Ronald

Austing, Edith Folger and I saw an immature bird at Lake Grant, in Brown County, some thirty miles southeast of Cincinnati. Austing collected the bird, which proved to be a male (testes very small). The stomach contained about two hundred adult water beetles of the families Gyrinidae, Hydrophilidae and Dytiscidae. This specimen is in the skin collection of the University of Cincinnati's Department of Zoology. It measures: wing, 265 mm.; tail, 112; culmen, 110 (114 if measured along the curve); tarsus, 93. Thus far I have been unable to identify the bird as to species. In the letter above referred to, Dr. Oberholser expressed belief that *Plegadis falcinellus* and *P. mexicana* were indistinguishable in any but fully adult spring plumage.[1]—Emerson Kemsies, *Department of Zoology, University of Cincinnati, Cincinnati, Ohio.*

Reidentification of some Swans, Scoters, and a Jaeger from Kansas.—While engaged in work with the bird collection of the University of Kansas Museum of Natural History, I have noted several important misidentifications of birds taken in Kansas.

Trumpeter Swan (*Cygnus buccinator*). This museum has three skeletons (two without data) and one mounted specimen allegedly of this species. All have proven, when critically examined, to be Whistling Swans (*Cygnus columbianus*). The skeleton with data (UKMNH No. 11949) and the mounted bird (UKMNH No. 7475) were taken at Lawrence, Douglas County, Kansas, in 1888, and have long been regarded as the only state specimens of the Trumpeter Swan. There seems to be no reason to doubt the early records of the Trumpeter Swan in Kansas. Goss (1891. "History of the Birds of Kansas," p. 108) mentions the "loud clarion voice" of this species, and indicates that it was more common in migration than the Whistling Swan (although this may be doubtful, since the Trumpeter apparently has never been as migratory as the Whistler, and it may not have been at all common or regular in Kansas even in the early days). The fact remains, however, that no specimen of the Trumpeter Swan from Kansas seems to have been preserved.

The skeletons mentioned above were readily identified on the basis of the convolutions of the trachea within the sternum. The mounted specimen was identified on the basis of size—wing, 20.5 inches; tail, 6.25; tarsus, 3.75; eye to hind edge of nostril, 2.37; tip of bill to hind edge of nostril, 2.19. Probably the original misidentifications were based on the false premise that all Whistling Swans have a yellow spot on the bill in front of the eye, and, therefore, that any swan lacking this spot must be a Trumpeter.

American Scoter (*Oidemia nigra americana*). This scoter was first reported from Kansas by L. L. Dyche (1909. *Trans. Kansas Acad. Sci.*, 22: 311) on the basis of two specimens. One (UKMNH No. 7735), by plumage a female, was taken at Lakeview, Douglas County, on November 1, 1908, by Edward E. Brown. The other (UKMNH No. 7743), also a female, was taken at Lawrence on October 24, 1908, by George Weyermiller. W. S. Long (1940. *Trans. Kansas Acad. Sci.*, 43: 438) indicates that the specimens taken in 1908 are the only records for the American Scoter in Kansas. Actually, however, both specimens are Surf Scoters (*Melanitta perspicillata*), with the female plumage and feathering about the base of the bill characteristic of that species. These specimens raise to eight the number of known specimens of the Surf Scoter taken in Kansas. The American Scoter, although recorded from the Kansas City region of Missouri (H. Harris, 1919. *Trans. Acad. Sci. St. Louis*, 23: 237), must, for the present, be dropped from the list of Kansas birds.

Parasitic Jaeger (*Stercorarius parasiticus*). F. H. Snow (1904. *Auk*, 21: 284; and 1905. *Trans. Kansas Acad. Sci.*, 19: 263) first reported the Parasitic Jaeger from Kansas. He wrote: "a young male [of this species] was captured along the Kansas river near Lawrence on October 10, 1898, by [Gus Berger and] Banks Brown. The specimen [UKMNH No. 6967] was mounted . . . and is now in the museum of the University of Kansas. . . ." This record has been re-

[1] Note, in this connection, the comments of Ernest P. Edwards (1950. *Condor*, 52: 262) concerning variation in color of facial skin in museum specimens.—Editors.

published or cited unchallenged in subsequent lists pertaining to Kansas birds (see C. D. Bunker, 1913. *Kansas Univ. Sci. Bull.*, 7: 139; W. S. Long, *op. cit.*: 443; and American Ornithologists' Union Check-List, Fourth Ed., 1931: 129).

I recently remade the mounted jaeger in question into a study skin. Examination of the bird at that time disclosed that it was actually an immature Pomarine Jaeger (*Stercorarius pomarinus*). It measured as follows: wing, 337 mm.; tail, 140 (central pair of rectrices rounded and projecting 9.7 mm. beyond adjacent rectrices); tarsus, 51.4; middle toe (without claw), 42.5; exposed culmen, 38; depth of bill at base, 14.2; width of bill at base, 13; cere, 21.6; dertrum, 18.0.

The specimen under discussion is the only jaeger ever reported as taken in Kansas, although all three species have been reported from the vicinity of Kansas City in Missouri (Harris, *op. cit.*, pp. 224–225). The Parasitic Jaeger has not been authentically reported from Kansas, therefore, while the present note will serve to add the Pomarine Jaeger to the Kansas list.—Harrison B. Tordoff, *Museum of Natural History, University of Kansas, Lawrence.*

Deep diving of the Old-squaw.—Having heard that Herman J. Freitag, a commercial fisherman at Kenosha, Wisconsin, had taken 37 Old-squaws (*Clangula hyemalis*) in nets set at a depth of 150 feet seven miles off shore, I wrote to him for confirmation. Under date of December 28, 1950, he stated: ". . . we always sound the depth of the shallow end of the nets. I thought this was deep until I talked to my brothers fishing out of South Haven, Mich., who got them in 180 and 190 feet of water this fall." The latter depths approach the maximum previously reported by me (1947. *Wilson Bulletin*, 59: 151).—A. W. Schorger, *168 N. Prospect Ave., Madison, Wisconsin.*

Marsh Hawk catching a Mourning Dove.—On May 21, 1946, I observed a Marsh Hawk (*Circus cyaneus*) in pursuit of a Mourning Dove (*Zenaidura macroura*) at Craigheads, Cumberland County, Pennsylvania. The hawk flew a few feet above and behind the dove which was about eight feet off the ground at the edge of a square 10-acre wheat field. By swerving sharply to one side or the other and dipping low over the ground, the dove was able to elude several strikes of the hawk before they reached the center of the field. Each time the hawk closed the gap as it struck, then banked quickly to maintain a slight altitude advantage when the maneuvering dove eluded it. The erratic twisting course made both birds appear slow-moving. In the center of the field, however, the dove was closer to the ground and appeared exhausted. The hawk made a swift direct stoop, grasped the dove in one foot, and without pause or change in altitude wheeled and carried the dove back along the course of pursuit and out of my view. This incident was observed through a 7 x 35 mm. binocular from the edge of the field. It took place quickly—perhaps in one minute.—John L. George, *Department of Zoology, Vassar College, Poughkeepsie, New York.*

Marbled Godwit, Upland Plover, Burrowing Owl and Yellow-headed Blackbird in Chicago area.—Week-end bird observations from 1942 to 1950 in the Chicago area produced a few interesting results. On May 4, 1947, I saw a Marbled Godwit (*Limosa fedoa*) near Warrenville, Illinois, and on September 21, 1947, a Burrowing Owl (*Speotyto cunicularia*) near Barrington, Illinois. Each of these had been recorded in the Chicago region only once before (see Ford, Sanborn, and Coursen, 1934. Chicago Acad. Sci. Program of Activities, 5 (2–3), respectively pp. 42 and 46). Two species which I sought especially; which Ford, Sanborn, and Coursen (*ibid.*, respectively pp. 39 and 65) called "fairly common"; and which Woodruff (1907. Chicago Acad. Sci. Bull. 6) called "common", I recorded on only one occasion each: the Upland Plover (*Bartramia longicauda*), a pair with two well grown young, near Brunswick, Lake County, Indiana, June 17, 1949; and the Yellow-headed Blackbird (*X. xanthocephalus*), a male at Calumet Lake, Illinois, May 7, 1948.—W. L. McAtee, *3 Davie Circle, Chapel Hill, North Carolina.*

Iceland Gull in Florida.—On January 6, 1950, while my wife and I were driving over the Long Key viaduct on the Florida Overseas Highway we noticed that one of the gulls drifting overhead was white-winged. It was about twenty-five feet above us and was sailing along on motionless wings apparently using an updraft caused by the viaduct. It was about the size of a small Herring Gull (*Larus argentatus*) and its pure white wing tips stood out brilliantly against the deep blue sky. For more than a mile we drove along slowly, staying about

An Iceland Gull (*Larus glaucoides*) flying over the Florida Overseas Highway. Photographed on January 6, 1950, by Helen Gere Cruickshank.

fifty feet behind the bird, studying it closely. Four times I drove directly under and beyond it, stopping long enough for my wife to take photographs with her Leica. We identified the bird as an Iceland Gull (*Larus glaucoides*).[1]

The Iceland Gull has been reported from Florida only once before. On February 9, 1927, near the town of Crystal River, at the head of Crystal Bay along the west coast in Citrus County (roughly 300 miles northwest of Long Key), O. F. Swed collected a specimen which is now in the Florida State Museum (Howell, 1932. "Florida Bird Life," p. 255). Our seeing the species off extreme southern Florida calls to mind Griscom's statement (1950. *Aud. Field Notes*, 4: 191) that the flight of white-winged gulls in the winter of 1949–1950 was "one of the three heaviest flights in history in the Northeast."—ALLAN D. CRUICKSHANK, *Highland Hall, Rye, New York.*

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[1] *Larus glaucoides* Meyer (1822) appears to be the earliest name for the Iceland Gull. *Larus leucopterus*, a name currently in wide use for the species, was bestowed by Vieillot in 1820, but Vieillot's description did not apply indubitably to any such small white-winged form as the Iceland Gull is known to be, hence the name *leucopterus* is not acceptable (see Mayaud, 1934. *Alauda*, 6: 370–375).—G. M. S.

The nest and eggs of *Smaragdites t. theresiae*.—The Goldenthroat, *Smaragdites t. theresiae*, is a rather small hummingbird with rounded tail. It is bright green all over except for the primaries and primary coverts, which are dark brownish gray, glossed with purplish blue, and the belly feathers and under tail coverts, which are partly white. The rectrices, which are rather narrow, are glittering grass green. The chin, throat, and breast are brilliant light golden green. The species inhabits the Guianas, Venezuela, and northern Brazil (Pará west to Manáos and the Madeira and Tapajóz Rivers). Specimens which I have collected in Surinam weighed: two males, 3.58 and 3.6 grams; three females, 3.5, 3.5, and 3.8 grams.

Nests of *Smaragdites t. theresiae* in dead shrubbery on open savanna near the airfield at Zanderij, Surinam. That on the left was photographed July 24, 1949; the other, August 26, 1950. Photographs by F. Haverschmidt.

I have been unable to find a description of the nest and eggs of this species. The eggs are not in the collection of the British Museum (Oates and Reid, 1903. Cat. Coll. Eggs in the British Museum, Vol. 3, London), in the Nehrkorn collection (1910. Katalog der Eiersammlung, Berlin), or in the Penard Surinam collection (Hellebrekers, 1942. *Zoologische Mededeelingen*, 24: 254–255).

In Surinam *Smaragdites theresiae* inhabits open sandy savannas throughout which the only vegetation is grass and low-growing shrubbery. Near the Zanderij airfield, where the species is rather common, I found four nests, each in exactly the same sort of exposed situation about 50 cm. from the ground in a fork formed of two dead stems of a low shrub. Each was composed of a very soft material (plant down of some sort, probably) of a beautiful cinammon color. Scattered patches of lichens were attached to the outside. Not one of the nests was concealed in the least, each being visible at a considerable distance.

I found the first nest on July 24, 1949 (see photo). It held two much-incubated eggs. These measured 12.5 x 8.2 and 12.2 x 8.2 mm. The nest—an unusually large one for the species—measured (in millimeters): height, 57; over-all width, 34; thickness of wall, 14; depth of cup,

17. I collected the incubating female so as to be sure of the identification.

On August 21, 1949, I found an empty nest of the same sort not far from the first.

On August 28, 1949, I found an unfinished nest. It contained one egg (weight 0.48 grams) on September 4 and 5. On September 11 it held two eggs and the female was incubating. When I visited it several days later the eggs, as well as the female bird, were gone.

On August 26, 1950, I found a nest through watching the owner fly to it. It contained a well-fledged young bird which flew off as I approached. I collected the adult female.—Fr. Haverschmidt, *P. O. Box 644, Paramaribo, Surinam, Dutch Guiana.*

Clark's Nutcracker in the Chisos Mountains, Texas.—On October 20, 1950, Mr. and Mrs. O. W. Letson, of Tulsa, Oklahoma, and I observed a Clark's Nutcracker (*Nucifraga columbiana*) in the Chisos Mountains, in Big Bend International Park, Brewster County, Texas. The bird was feeding in the tops of not very high pinyon pines (*Pinus edulis*) at an elevation of about 6000 feet on the north side of the divide between The Basin and Juniper Canyon. We first encountered it in the vicinity of the 'cactus garden' on the recently constructed foot trail leading to Lost Mine Peak from the road at the rim of The Basin. The spot was approximately one and one-half miles north of Upper Juniper Spring and the same distance west of Lost Mine Peak. We watched the bird for twenty minutes as it moved about, sometimes flashing its black and white wings and tail while balancing at the tip of a slender branch. It seemed quite unconcerned by our presence, allowing us to approach to within 50 feet of the tree in which it was feeding.

Nucifraga columbiana was not listed by Van Tyne and Sutton from Brewster County, Texas (1937. *Univ. Mich. Mus. Zool. Misc. Publ.*, 37), nor by Burleigh and Lowery from the Guadalupe Mountains of western Texas (1940. *La. State Univ. Occ. Papers No. 8*). The species is believed to range normally southward as far as southern New Mexico, southern Arizona and northern Baja California. Starker Leopold has reported it from the State of Nuevo León, in México (1946. *Condor*, 48: 278). As Bent (1946. *U. S. Natl. Mus. Bull.* 191: 321) has pointed out, "the nutcracker is given to erratic wanderings that sometimes take it considerable distance from its normal range."—John E. Galley, *1610 W. Holloway Ave., Midland, Texas.*

First successful nesting of the Cerulean Warbler in New Jersey.—On June 6, 1950, at a picnic in the Greenbrook Sanctuary of the Palisades Interstate Park in New Jersey, less than five miles north of the George Washington Bridge, Mrs. Marjorie Kirkpatrick of Livingston, New Jersey, reported hearing the songs of a Cerulean Warbler (*Dendroica cerulea*). After a search, a dozen or so of us located a pair of the warblers and their partly finished nest. The nest was in a sweet gum well out on a branch high over a junction of paths and a road along which the whole party had passed earlier in the day. Nesting material was being gathered on the ground and from an old vireo nest higher in the same tree. The male sang many times as the female added material to the nest. The presence of the several observers had no noticeable effect on the birds.

On June 10, when I next visited the nest, the female was on it and the male was singing in a nearby tree. On June 17 at 6:30 a.m. Mr. Dater and I again visited the nest. The female was sitting and the male singing, as before. A storm of heavy rain and high wind broke just after our arrival. We checked once more before leaving the area, finding that things seemed to be normal. Later in the day, however, another observer found the nest abandoned and noted a gaping hole in it. Subsequently, Mr. Collins, the park naturalist, detected egg remains on the ground below.

On July 13 two other members of the Ridgewood Audubon Society and I succeeded in finding a second Cerulean Warbler nest some two hundred feet from the first. The new nest was in an oak about thirty-six feet from the ground. In the nest we could see two young

birds, which seemed about ready to leave. They were fed at ten minute intervals by both parents, but during our two hours of observation the parents never arrived at the nest at the same time. On July 15 observers reported that the young had left.

Early in November Mr. Dater cut down the nest. It agrees in general appearance and structure with nests described by Chapman (1907. "The Warblers of North America," p. 174), except that there is a great deal of soft, pulpy white paper (perhaps weathered paper napkins left by picnickers) in the base and wall. This paper, which entirely surrounds some of the supporting twigs, is visible even inside the cup. The walls and lining are very thin.

The Cerulean Warbler has been regarded as a rare migrant in New Jersey. The nearest nesting area has been Dutchess County, New York, on the other side of the Hudson River farther north (Cruickshank, 1942. "Birds Around New York City," p. 392). In 1947 a female built a nest near Lyons, New Jersey, but the eggs never hatched (Nichols, 1947. *Audubon Field Notes*, 1: 172).—ELEANOR E. (MRS. J. Y. JR.) DATER, *259 Grove St., Ramsey, New Jersey.*

English Sparrows eating locust leaf-miners.—For the past several seasons there has been a severe outbreak of the locust leaf-miner (*Chalepus dorsalis* Thunberg) on black locust in the central Appalachian region. Adult beetles appear about the first of June, depositing their eggs within the tissues of the locust leaves. Larvae feed on the tissues between the two outer surfaces, causing blotch mines in the leaves. Often practically every leaf on a tree is affected and the whole tree turns brown. Pupae form within the curled-up edges of the leaf epidermis in late July or early August.

My attention has frequently been called to large numbers of English Sparrows, *Passer domesticus* (Linnaeus), feeding in trees infested with these locust leaf-miners. During the summer of 1950 I repeatedly watched, through binoculars, these birds searching the locust leaves and feeding on adult beetles, larvae, and pupae. The birds systematically searched around the curled-up edges of the browned leaf epidermis. Flocks of thirty to fifty birds regularly fed in this manner in a locust tree near my home at Morgantown, West Virginia. On July 5, I saw one English Sparrow eat eleven larvae in a period of a little more than three minutes.

The leaf-miner outbreak has been an extensive one, and I do not mean to suggest that English Sparrows have been an important factor in the control of the pest. It is of interest, however, to see this much-maligned bird doing useful work in destroying shade-tree insects. —MAURICE BROOKS, *Division of Forestry, West Virginia University, Morgantown.*

An aberrantly colored Summer Tanager.—On May 17, 1950, while studying the bird population of a tract of 60-year-old loblolly and shortleaf pine (*Pinus taeda* and *P. echinata*) about one mile south of Athens, Clarke County, Georgia, I observed an adult male Summer Tanager (*Piranga rubra*) in company with a slightly smaller red and yellow bird which at first I believed to be a young male. Realizing that young birds were not even out of the nest at that early date, I tried to recall whether I had ever before seen a red and yellow subadult male of that sort in the spring. While watching the two birds I noticed that the adult male was *courting* the other. I collected the red and yellow bird. Dissection revealed it to be an adult female with several well-developed ova, the largest about 10 mm. in diameter. No malignancy or abnormality was perceptible in the ovary or any other internal organ.

In color the specimen resembles an adult male, especially above. Nowhere, except possibly on the tail, is the red quite as bright as that of an average adult male, but the patches of dull olive-green are not noticeable, the general effect being of a *red* bird. Actually, the whole scapular tract on the right side is olive green while that on the left is largely red. In both wings some lesser coverts, middle coverts, greater coverts and remiges are definitely red, others definitely olive green. In both wings the four outermost primaries and all the primary coverts

and alula feathers are green-edged or brown-edged (i.e., not red). The under parts throughout are a mixture of dull red and buffy yellow, the effect being rather blotchy, the red being brightest in the middle of the lower throat, on the chest, and in the middle of the belly. Most of the rectrices are missing, but the five remaining ones, all on the right side, are uniformly dull red. According to Ridgway (1902. "The Birds of North and Middle America," Part 2, p. 80) "adult females not unfrequently show touches of red, sometimes a considerable amount of this color, but such females may be distinguished from immature males by the duller color of the red."

In size the specimen resembles a normal adult female. The wing measures 90.5 mm., the tail 69, the exposed culmen 18, the tarsus 19.5.—David W. Johnston, *Department of Biology, University of Georgia, Athens.*

The Cardinal in winter in North Dakota.—During the winter of 1949–50 at least two male Cardinals (*Richmondena cardinalis*) were seen repeatedly near Bismarck, Burleigh County, North Dakota. This is of particular interest since to the best of my knowledge only in recent years has this species been reported anywhere in North Dakota west of the Red River Valley. The Red River is about 200 miles east of Bismarck.

On January 1, 1950, Mr. D. B. Vogtman and I observed one Cardinal at a farm feed-lot in the bottoms of the Missouri River about four miles north of Bismarck. Mr. A. Pasquetti, the farmer on whose place we saw the bird, reported that he had seen it there almost daily since early in December.

On January 2 and 3 a male Cardinal was seen at a point about two miles north of the feed-lot occupied by the first bird. However, not until January 7th was the existence of two birds definitely established. Mr. Pasquetti saw the first Cardinal almost daily through January, February, and March, and I saw it on an average of twice a week during this period. An adequate food supply was available at the feed-lot where millet was being fed to livestock and grain to poultry. Trees and brush in the bottomland and adjacent coulee provided sufficient cover. The bird appeared to be in good condition. We last saw it in the evening before a severe blizzard near the end of March. It may have perished during the storm. Despite a search of known roosting spots just after the storm and later, when the snow had melted, we found no sign of the bird.

Weather during this entire period was severe. The average temperature for January was −10.2°F. with a minimum of − 44°F. Blizzard conditions prevailed on many days. There were 14 inches of snow on the ground at the end of January. February was somewhat milder with an average temperature of 7.9°F. March temperatures averaged about 22°—about 3° below normal. Nearly 30 inches of snow fell during the month and there were several severe blizzards.—Robert N. Randall, *Fish and Wildlife Service, Bismarck, North Dakota.*

Young Goldfinches eaten by garter snake.—In my three-year study of the ecology of Michigan garter snakes I have obtained hundreds of field food records, but of 230 such records for the Common Garter Snake (*Thamnophis s. sirtalis*) only two showed evidence of predation upon birds.

On April 26, 1948, near Dixboro, Washtenaw County, Michigan, I forced a large female Common Garter Snake to regurgitate an adult Song Sparrow (*Melospiza melodia*). The snake may have found the sparrow dead, for I believe it would be difficult for this snake to catch a healthy adult bird of any sort.

On August 1, 1950, in the same area, I found a gravid female Common Garter Snake at the nest of a Goldfinch (*Spinus tristis*). The nest, which was well hidden among leafage, was 2½ feet from the ground on a horizontal branch in a 6-foot hawthorn (*Crataegus* sp.) bush in the center of a pasture.

At first I saw only part of the snake's body, but on closer examination, I noticed that its head was just above the cup of the nest. Protruding from its mouth was some thistle down from

the lining of the nest. I approached as close as possible without disturbing it in order to take photographs. In about five minutes, it became wary and started to crawl away.

I caught the snake and forced it to regurgitate four recently hatched Goldfinches plus a small quantity of thistle down. All the birds were dead. Remaining in the nest were one dead nestling (the intestine protruding from the ruptured abdominal wall) and a crushed egg with a dead embryo. I was unable to determine whether the young were dead when the snake ate them. I heard cries of distress from adult Goldfinches while I was near the nest, but could not be sure that any of these birds were the actual owners.—CHARLES C. CARPENTER, *Department of Zoology, University of Michigan, Ann Arbor.*

VIRGINIA CAVENDISH

Virginia Cavendish, renowned landscape architect and garden specialist, active ornithologist and ardent conservationist, and, above all, a much loved citizen of her native Huntington and West Virginia, died January 18, 1951, just after an operation. A member of our Club since 1946, she became a Life Member very recently. At the time of her death she was secretary of the Huntington Galleries project, active in the National Council of Garden Clubs, and a pillar of the Huntington Bird Study Club. A memorial area on the grounds of the Huntington Galleries is being created as a tribute to her. In a letter written just before her death she said: "I don't suppose anyone ever had so much fun as I have had through the years—or left as few ripples as he passed." Birds were an important part of the 'fun' in Miss Cavendish's life. As for the 'ripples', let time and her many friends be the judge.

EDITORIAL

The stimulating report on Graduate Research in Ornithology in the March issue of the *Bulletin* has sharpened focus on the scope of projects currently under investigation. It is encouraging to note the renewed interest in anatomical studies which must inevitably lead to a better understanding of the relationships among birds. Because of our special interest in avian morphology, we present a plea in behalf of all workers engaged in this phase of ornithology.

In 1947 we began a long-term study of the anatomy and classification of the Cuculiformes. While tabulating available skeletal and alcoholic material in American and foreign museums, it soon became evident that as much time would be consumed in obtaining specimens as would be required for the actual research.

Long ago W. A. Forbes (1881. *Ibis:* 175) wrote as follows: "There are, however, still left a considerable number [of genera] of which I have not as yet succeeded in obtaining any examples . . . I hope, therefore, that any members of the B.O.U., or travellers or naturalists generally, who may have it in their power to obtain specimens of any of these my 'desiderata,' will do all they can to enable me to acquire these forms." More recently, the late Percy R. Lowe (1943. *Ibis:* 490) said: "I cannot help thinking that if ornithologists took as much trouble in procuring specimens in spirit, both at home and abroad, the subject of the classification of birds would be proportionately benefited and expedited. Even in such fine collections in spirit as are to be found in the British Museum, it is rare for the labours of the anatomist in any given group not to be held up by lack of material. . ."

Plagued by this lack of material, ornithologists have perforce published anatomical papers based on one or two specimens. Important though these papers may have been, we now know that individual variation must be considered in any thorough study. At the same time, when statistical analysis of variation is based on inadequate data, anatomical or otherwise, it leads to overweening ostentation and to specious conclusions. Biometrics is an essential tool but it becomes a farce when improperly applied.

Students of human anatomy long have recognized the wide limits of "normal variation" in the origin and pattern of blood vessels, nerves and muscles. The origin of a blood vessel, for example, may be described as normal even though it has such an origin in only 50 percent of specimens. It should be pointed out that experienced human anatomists do not attempt to determine the normal pattern or normal limits of variation for a specific structure until at least a hundred (preferably 150 to 200) specimens have been examined. Can we, then, in avian morphology expect reliable results from descriptions based on but one or two specimens? Recent investigations have shown that certain regions of the avian vertebral column are far more variable than early ornithological literature indicates. May not these early papers, quoted so repeatedly in taxonomic works, be leading us to erroneous conclusions?

Each anatomist must determine, for the specific group being investigated, how many alcoholic specimens are necessary to give a reliable picture. There is, however, no maximum number of accurately sexed, *articulated* skeletons which may be analyzed advantageously: the larger the sample, the greater the reliance which can be placed on statistical results. A paucity of skeletal material produces indicative rather than conclusive results. Nevertheless, it is obvious that the anatomist can study only that material which is available to him.

More than forty avian families are endemic to the New World. Notwithstanding the fact that several of these are monotypic, there is not a single monographic treatment of the total anatomy of any family. The internal anatomy of many genera is unknown. This fact was emphasized by Griscom (1950. *Bull. Mus. Comp. Zool.*, vol. 103, No. 6: 344) when he stated that "In several very large tropical American families based on internal characters (not

determinable in the museum skin), hundreds of species are currently assigned to these families without a shred of evidence that they possess the necessary internal characters!"

If we hope to encourage thorough anatomical studies, and thereby to further the cause of taxonomy, greater emphasis must be placed on the collecting of skeletons and alcoholic material. The collecting of such material must, for the most part, be a function of the larger scientific institutions. In some cases it appears that a change in philosophy towards specimens must be effected: from "skins, more skins" to "skin, skeleton, spirit."

In the meantime, publication of the report on Graduate Research will have served to acquaint anatomists with the work of their contemporaries and may, therefore, facilitate the collecting and exchange of desired material.—A. J. B.

Not long ago we made a point of seeing Walt Disney's 'Beaver Valley,' a beautiful and entertaining motion picture film which could have been soul-satisfying as well. The scene showing the Marsh Hawk (*Circus cyaneus*) passing prey to its mate in midair was thrilling; but how quickly our pleasure changed to dissatisfaction when, listening to a comment on the feeding of that prey to the young hawks, we saw a Cooper's Hawk (*Accipiter cooperii*) at its nest! Similarly, we followed a Bittern (*Botaurus lentiginosus*) about, heard words to the effect that it was obtaining food for its young, then were shown a *Least* Bittern (*Ixobrychus exilis*) at its nest. For this particular form of inaccuracy or half-honesty there is no excuse in this enlightened age, and it would certainly have been avoided had the two men who took the photographs—Wilson Club members Karl Maslowski and Murl Deusing—been given a chance to edit the film or commentary. Knowing that there was a mixup in the bird identifications we could not help wondering how many amphibians from far removed corners of the continent had contributed their croaking and trilling to that amusing Rocky Mountain beaver pond burlesque of opera. The film was exceptionally good in some ways. We shall long remember it for its late-working beavers and romping otters. But as a whole it could—and should—have been very much better.—G. M. S.

The color plate fund has climbed steadily. So generous has been the response to our implied request for funds—when we offered for sale prints of the color plate used in the December *Bulletin*—that we shall be able to publish soon the engraving of Hal Harrison's beautiful kodachrome of the Wilson's Warbler at its nest. The engraving is being donated by Samuel A. Grimes. Names of all contributors to the fund will be announced later; but we wish to acknowledge here the money 'with no strings attached' given us by Herbert L. Stoddard, Sr., Dr. and Mrs. Powell Cottrille, Clarence B. Randall, Malvina Trussell, the late Virginia Cavendish, Mr. and Mrs. Richard R. Graber, H. Lewis Batts, Jr., and Eugene Eisenmann.

Richard and Jean Graber are hard at work in San Luis Potosí, México, assisting George H. Lowery, Jr. and Robert J. Newman with their ornithological survey of that state. The final report promises to establish a new standard for field and laboratory work of this sort.

With great interest we learn of the recent coming into being of the Oklahoma Ornithological Society. Dale Arvey was elected president, but his being called to service overseas has placed the reins in the hands of Joe C. Creager of Ponca City. The first number of the Society's *Bulletin* appeared in January, 1951. We can see from perusing this that Oklahoma ornithologists are a lively, forward-looking group.

Those of us who have fed birds in winter have long known how fond birds are of nut meats. Pecans are a special favorite—perhaps because of the high fat and protein content, perhaps (we venture to guess) because they taste good. Herbert Stoddard has found that such in-

sectivorous birds as warblers, titmice and kinglets eat pecan meats avidly. The Pecano Bird Feed Company is offering 100 percent pecan meats at 25 cents a pound in 10-, 25-, and 50-pound containers. This is good news for the birds. Address the Pecano Bird Feed Company, 110 West Street, Albany, Georgia.

Our Membership Committee has been working hard and the membership has been climbing steadily. Especially gratifying has been the prompt and voluntary action of well over one hundred persons in raising their status from associate to active, or active to sustaining membership. The more funds we have, the better the *Bulletin*.

Jesse M. Shaver, Professor of Biology at George Peabody College for Teachers at Nashville, Tennessee, was awarded the honorary degree of Doctor of Science by Tusculum College, Greeneville, Tennessee, at their 155th Commencement on June 5, 1950. Dr. Shaver has been a member of The Wilson Ornithological Club since 1922. He served the Club as Secretary for several years, and as President from 1932 to 1934. He has been a Member of the American Ornithologists' Union since 1924, and Editor of the *Journal of the Tennessee Academy of Science* since 1928.

We regret to report the death of two prominent members of The Wilson Ornithological Club—Charles William Gustave Eifrig, who died in Windermere, Florida, November 1, 1949, at the age of 78; and Edward Russell Ford, who died in Winnetka, Illinois, January 13, 1951, at the age of 76. Professor Eifrig, an active member of the Club since 1907, was born in Doebeln, Germany and moved to America with his family when he was a child. He was a clergyman for some years, then joined the faculty of Concordia Teachers College. After 33 years of service in this institution he became Professor Emeritus. Valparaiso University conferred upon him the degree of Doctor of Science in 1942. He was an active field ornithologist and published many papers on birds as well as two books on fishes, amphibians, reptiles and mammals. He was president of the Illinois Audubon Society from 1930 to 1941.

Mr. Ford was an associate member of The Wilson Ornithological Club from 1920 to 1936 and an active member from 1936 to the time of his death. He was born in Malden, Massachusetts, on December 27, 1875. He was Honorary Curator of Oölogy at the Chicago Academy of Sciences from 1931 to 1933 and Honorary Curator of Ornithology there from 1933 to the time of his death. Professionally a publisher, he continued in that business until 1928. From then on he was able to devote more time to birds. He was a keen field naturalist and fine companion. He published a number of articles about birds in *The Chicago Naturalist* and *The Audubon Bulletin*. He is best known for his senior authorship of "Birds of the Chicago Region," published in 1934 by the Chicago Academy of Sciences. His co-authors were Colin C. Sanborn and C. Blair Coursen.

Hal H. Harrison as photographer and author, M. Graham Netting as editor, *The Pennsylvania Angler* as original publisher, and the Fish Commission of the Commonwealth of Pennsylvania as distributor, are to be congratulated on "Pennsylvania Reptiles and Amphibians," an opus which has recently come to our desk as a 24-page brochure—all in all one of the liveliest, most informative herpetological presentations we have seen in some time. Ostensibly a picture story, the legends for the many photographs are crammed with facts. For once in their lowly lives, Pennsylvania snakes, turtles, frogs, toads, and salamanders have found good friends. As ornithologists we should rejoice that these 'other vertebrates' are receiving attention of this sort. How much of our thought have we given to reptiles and amphibians and the lives they lead? Have we not let ourselves get into the rut of indifference? Or, worse, have we not allowed ourselves to *use* these animals in attaining our own ends? How many of us have pleaded the cause of hawk protection knowing that each time we mentioned a hawk's eating of snakes

we were winning love and praise for the hawk, blame and hatred for the snakes? Such an attitude is unscientific and unfair. The time has come for us to know these 'other vertebrates' for what they are: to enjoy their beauty; to find reward in watching them; to acknowledge, deep inside ourselves, that they belong not 'under our heel,' as the saying goes, but in our world as friends and allies.

Small but highly colorful and pleasing reproductions of 24 of John James Audubon's bird paintings have been reproduced recently by the National Audubon Society as Audubon Centennial Stamps, for use in decorating letters, envelopes and packages "in order that Audubon paintings will receive during the Centennial Year [Audubon died in 1851] the public attention which they merit." We submit that there are other uses for these attractive stamps. One youngster we know has found delight in pasting them into a bird-book of her own making. Another has cut out the tiny bird figures and arranged them in a perfect circle on his own private mirror. The two sets, totalling 24 stamps, are being sold for $1. Proceeds from the sale will be devoted to the conservation work of the Society. Address the National Audubon Society, 1000 Fifth Avenue, New York 28, New York.

Austin L. Rand, Curator of Birds at the Chicago Natural History Museum, is now visiting El Salvador where he will remain about six months conducting field studies that will serve as the basis of a semi-popular bird guide to be written in collaboration with Melvin A. Traylor, Research Associate at the Chicago Museum. The project was undertaken at the request of the Instituto Tropical de Investigaciones Científicas, a research institute associated with the University of El Salvador, as part of a cooperative program entered upon with the Chicago Natural History Museum. Publication of the volume, in Spanish, will be undertaken by the El Salvador institution next year.

Fred T. Hall, a member of our Executive Council, and, until recently, Director of the Davenport Public Museum, has been appointed Director of the Buffalo Museum of Science. He served as Chairman of the Local Committee in charge of Arrangements for our Thirty-Second Annual Meeting in Davenport, in April.

Mr. Hall received his education at Wabash College, Crawfordsville, Indiana, where he majored in biological science, and at the Rochester Institute of Technology, where he studied art. He served for a time as head of the Biological and Anatomical Model Department of Ward's Natural Science Establishment in Rochester. His published papers deal with entomology, paleontology and ornithology. His bird paintings have been shown in many recent exhibits of ornithological art.

The editors are grateful to the following for assistance in preparing for publication the material appearing in this issue: Aaron M. Bagg, E. Alexander Bergstrom, Donald J. Borror, William L. Brudon, Eugene Eisenmann, W. W. H. Gunn, William A. Lunk, Harold F. Mayfield, A. D. Moore, Allan R. Phillips, R. M. Strong, H. B. Tordoff, Milton B. Trautman, and J. Van Tyne. They are especially grateful to Elsa Hertz for her expert typing.

At the recent meeting of the Club, Harrison B. Tordoff was elected editor of *The Wilson Bulletin*. Manuscripts intended for publication in 1952 should be addressed to him at the Museum of Natural History, University of Kansas, Lawrence, Kansas. Correspondence concerning the 1951 volume should, however, be directed to Dr. Sutton or Dr. Berger. Dr. Sutton will teach ornithology and bird art at the University of Oklahoma Biological Station, at Lake Texoma, Willis, Oklahoma, from June 9 to August 4. Dr. Berger may be addressed at the Department of Anatomy, East Medical Building, University of Michigan, Ann Arbor.

In this issue of the *Bulletin* appears the first of a series of color plates based on field sketches made in México in 1938 by George Miksch Sutton. Publication of this series has been made possible through the interest and generosity of the Hilton family, of Lincoln, Nebraska. The plates, eight in all, will stand as a memorial to David Clark Hilton, celebrated physician and surgeon, who died December 12, 1945.

PROPOSED AMENDMENT TO THE CONSTITUTION OF THE WILSON ORNITHOLOGICAL CLUB

The Club's schedule of dues has not been changed for many years. Although printing costs have risen the quality of the *Bulletin* has been maintained because the membership has steadily climbed. Recently, however, increases in printing costs have been outstripping the Club's rate of growth. The Executive Council and the Editors are interested not only in maintaining the *Bulletin's* present high standards, but in seeing the journal substantially enlarged and improved. The program will require additional revenue.

An appropriate amendment to the Constitution was therefore proposed at the general meeting on April 27, 1951, at Davenport, Iowa. This amendment was recommended by unanimous vote of the executive council the previous day. In accordance with the Constitution and By-laws, the Council hereby asks for a mail ballot of approval. Every active member is urged to vote *yes* or *no* to this amendment by sending a letter or postcard, not later than September 1, 1951, to the Secretary, Harold Mayfield, 2557 Portsmouth Ave., Toledo 13, Ohio. The amendment reads as follows:

Effective October 1, 1951, the associate membership class ($2.00 dues) is to be discontinued, and the subscription price of *The Wilson Bulletin* is to be $3.00.

A LIFE MEMBER FROM CAROLINA

Elizabeth Barnhill (Mrs. Edwin O.) Clarkson was born a Texan but has lived in North Carolina all her married life. Educated as a concert pianist and organist, she has long been deeply interested in birds. With her husband she owns the beautiful, 23-year-old bird sanctuary, 'Wing Haven', a bit of which shows in our photograph. She has published a check-list of the birds of Charlotte and Mecklenburg County, North Carolina. She is a Life Associate of the American Ornithologists' Union; a Life Member of the National Audubon Society; and a member of the Cooper Ornithological Club, the Virginia Society for Ornithology, the North Carolina Academy of Science, and the American Association for the Advancement of Science. She became a Life Member of the Wilson Club in 1948.

ORNITHOLOGICAL LITERATURE

MENABONI'S BIRDS. By Athos and Sara Menaboni. Rinehart & Company, New York and Toronto, 1950: 9¼ × 12¾ in., 132 pp., 53 halftones and 32 unnumbered colored plates by Athos Menaboni. $10.00.

It is time that books featuring "bird art," which, in this country at least, has unhappily become segregated as a more or less distinct subdivision of art, and at times been regarded by some misinformed critics as nothing more than a form of two-dimensional taxidermy, be forced to stand on their own merits, rather than upon the claims of various publishing houses motivated primarily by thoughts of cash profits. There has been a regrettable tendency on the part of more than one publisher to announce each forthcoming work with such risky superlatives as "the greatest, the most beautiful, the truest to nature," and so on. If any qualification is made at all, it usually takes the form of "since Audubon," thus serving to perpetuate the awe which still largely paralyzes public thought in regard to the admittedly laudable, but far from superhuman, artistic efforts of the woodsman-artist. Perhaps a new high in ballyhoo has been attained by Rinehart and Company in the advance publicity for "Menaboni's Birds."

"This is a collection," we are told, "of the most beautiful, most faithful bird portraits painted in America in more than one hundred years. Not since Audubon's great Folio, have any American bird pictures created as much excitement. Menaboni's birds in flight, his meticulous detail and realistic settings have surprised and excited the naturalists. Critics and art connoisseurs, praising the unusual technique, the subtle shadings, and the radiant colors of the originals, call Athos Menaboni the greatest living portrait painter of bird life." Strong words! Beautiful some of the pictures may be, but it is a large order to live up to claims such as these; certainly opinions will vary widely. Possibly the statement about the excitement caused is true. If so, it is a testimonial to modern promotional methods. The naturalists have been surprised, there is no question; but "disturbed," rather than "excited," best describes the reactions of those with whom I have discussed this book. As far as the "critics and art connoisseurs" vaguely alluded to in the blurbs are concerned, they are no more qualified to elect the greatest living (or dead) *portrait painter* of bird life than would a Martian who had never seen a man be qualified to choose between Sargent, Al Capp, and Picasso as human portrait artists.

In the first place, let us make it plain that we are here discussing what is sometimes called academic art. That is, art which embodies a strong element of craft, and which requires no phony special genius or divinely-imparted mystic inspiration for its understanding. Those who invariably shout "bourgeois," or "mere illustration" in response to any timid request for truth in the painting of nature need read no further.

A portrait is a likeness. We are told that Menaboni's paintings are portraits of birds, and it seems fair, therefore, that they be so judged. A portrait of a person may be painstakingly executed, the details of hair, skin, and clothing rendered with consummate skill, yet if the carriage is wrong, if the relationships of the bones and features of the head are wanting in accuracy, the portrait fails. The likeness is not there; the essential character is lacking. And who shall judge this success or failure? Surely the acquaintances of the subject should have authority in the matter at least equal to those who have never seen him. Does it not follow that the evaluation of a bird portrait, at least as far as the likeness is concerned, is a province for the ornithologist as much as for the "art critic" whose experience with birds is limited to cursory glances at the pigeons of a Manhattan tower?

Menaboni's paintings reveal a pleasing grasp of the essentials of design and composition, and an excellent feeling for, and use of, color. They are characterized by a surprisingly uniform

delicacy of treatment. The artist is good at painting feathers,—remarkably good, yet he has apparently fallen prey to a fascination with diffuse, reflected light, to the extent that, in his paintings the softly abundant plumage of a Great Horned Owl, the fluffy feathers of a kinglet, the iridescent ones of a grackle, and the coarse, boardlike feathers of an eagle all appear to have approximately the same texture. The same is true of his work with plants. Many of the small flowers, twigs, and tendrils are painted with grace and delicacy, but he misses completely the strength and mass and rugged textures of a great bole or stump.

His greatest weakness is in structure. With all his painstaking study of plumages and feathers, his work shows an entirely inadequate grasp of the form, of the bony anatomy, of a bird. This is most evident in the larger species in which this anatomy is less conveniently cloaked in plumage, and results in a vague, disturbing superficiality which affects most of the plates. Particularly bad in this respect are his flying Cardinal (title page), Summer Tanagers, flying Marsh Hawk (resembling an old and poorly stuffed specimen with shiny new feathers), Golden Eagle, Sparrow Hawks, Pileated (consistently mis-spelled "piliated") Woodpeckers, Little Blue Herons, and Sharp-shinned Hawk. Faulty observation is revealed by the fact that many of the birds in flight have too many primaries and/or secondaries. This is painfully evident in the drawing of the flying Cardinal already mentioned above. Allowing the proper number of nine primaries, we find that this individual has eleven, rather than six, secondaries! No wonder this boneless wing looks peculiar.

Menaboni has had difficulty with his perspective in places, being troubled by the admittedly trying task of making a wing go away from him (Belted Kingfisher, Great Horned Owl). The size relationship of the sexes is in error in his drawing of Boat-tailed Grackles. He fails miserably in catching the facial "expressions" so important in portraits, the treatment of hawks and eagles being particularly unsympathetic in this respect.

Several of the plates, notwithstanding, are very good. I personally consider the Kentucky Warblers, Screech Owl, Ruby-crowned Kinglets, and Canada Geese well above the rest, and the half-tone of the two Black Skimmers is a masterpiece of decorative design. Menaboni is at his best with the small black and white vignettes scattered through the text. Many of these are extremely pleasing.

It is difficult to account for the way in which the plates are captioned. The brief description accompanying each appears on the back of the plate, facing the next one. This feature may lead to considerable confusion among non-ornithological readers.

The text by Sara Menaboni is a rambling, sometimes interesting, sometimes dull account of the Menabonis' life with birds, featuring a great deal of reference to various pets, and small experiences with nature. It is a most difficult task to write such a commentary without becoming at times trite and puerile, which pitfalls Mrs. Menaboni has not entirely avoided. Considerable anthropomorphism appears in the text, which seems to reveal the authors as sentimental amateur nature lovers rather than as scientists.

The Menabonis are to be congratulated on their perseverance and their deep love of wildlife. Had the book been publicized as a sincere expression of this love, beautifully produced and expensively illustrated with attractive and decorative pictures (which it is), rather than as one of the most authoritative ornithological works of decades, with the most faithful bird portraits (which it is not), there would be little fault to find with it.—Robert M. Mengel.

SUMMER BIRDS OF LINCOLN COUNTY, MAINE. By Allan D. Cruickshank. National Audubon Society, 1000 Fifth Avenue, New York City, [1950]: 6 × 9 in., 51 pp., 1 map. Paper. 50¢.

Maine's Lincoln County, lying on the coast, has many deeply cut harbors and inlets, and several offshore islands. Much of the forest cover is coniferous. Such is the general setting of this annotated list, one of the most detailed yet written on a specific area in the state.

Most of the information is based on observations made during summers, beginning in 1936, by the author and others while serving as instructors at the Audubon Nature Camp on Hog Island in Muscongus Bay. Notes and records have been admirably summarized; the status and local distribution of each species have been clearly indicated. Thus the booklet's principal purpose—to help future bird students know "which species to expect and where and when to look for them"—has been well met.

The author states in the introduction that 255 species have been recorded during the four summer months. This impressive total has been derived by including all published records (*e.g.*, the occurrence of the Great Auk in Muscongus Bay about 1605 and the brief residence of the European Migratory Quail following its introduction during 1879 and 1880) and by counting two races of *Ammospiza caudacuta* as separate species. Authorities for noteworthy records are given in parentheses, but it is usually impossible to determine, especially in the case of records antedating 1936, whether the authorities are authors of publications from which the records are taken, or persons who have supplied notes in unpublished form. This confusion could have been avoided by following standard citation practices.—Olin Sewall Pettingill, Jr.

A Study of Bird Populations in the Apple Orchards of the Annapolis Valley, Nova Scotia, With Particular Reference to the Effects of Orchard Sprays upon Them. By John P. Kelsall. Canadian Wildlife Service Wildlife Management Bulletin No. 1, Series 2, 1949: $8\frac{1}{2} \times 10\frac{7}{8}$ in., iv + 69 pp. (processed), 12 figures. Obtainable on request from Canadian Wildlife Service, Ottawa, Ontario.

The study was conducted from May 14 to September 16, 1946, to determine whether certain sprays were detrimental to the bird life. The method was to inspect each orchard by cruising back and forth in parallel strips with two rows of trees intervening. An attempt was made to count each individual bird in the area on each trip. The trips to each area varied from two to seven and were usually quite widely separated, in some instances encompassing both the latter part of the spring migration and first part of the fall migration as well as the breeding season. Schedules of trips to different orchards varied considerably with respect to the time of year covered. Trips were not designed to ascertain before- and after-spraying condition of the bird life, but rather the over-all differences in populations in sprayed and unsprayed orchards, and in orchards with and without insect infestation. The investigator stated that qualitative and quantitative data of a type desirable in a bird population study were frequently not recorded because they were not considered pertinent to the major line of investigation. Thus no distinction was made between migrants, wanderers, and breeding birds on the basis of territorial behavior or calendar period of observations.

The sizes of the orchards varied from 1.2 to 12 acres; some had turf strips between the rows, and some were cultivated completely. All but two of the orchards were sprayed with lead arsenate, calcium arsenate, or nicotine mixtures.

Conclusions were that the sprays did not have any directly injurious effect on bird life since no dead or sick birds were observed. In so far as the sprays were effective in materially reducing the insect population it reduced the bird population also. Birds were much less common in orchards in which insects were scarce than in those which were suffering outbreaks of eye-spotted budmoth or aphids. Birds were determined to be more than twice as numerous in orchards infested with budmoth as in those wherein no outbreak occurred. There was no evidence that birds were effective in keeping the insects under control since they ate only a small part of the larvae present. Song Sparrows, Robins, Chipping Sparrows, Savannah Sparrows, and Slate-colored Juncos made up over 80 percent of the total number of birds observed in all orchards. The Song Sparrow was the most numerous single species. It was

thought that aphids were favored by the smaller insectivorous birds and in orchards infested with these insects Yellow Warblers, Redstarts, Yellow-throats (*Geothlypis*), Myrtle Warblers, and Nashville Warblers made up 50 percent of the birds observed.

Bird populations of all orchards were considered to be smaller than those of other habitats in surrounding areas. However, there did not seem to be much difference between numbers of birds recorded in unsprayed orchards (12.7 birds per acre) of a single habitat, and surrounding areas of mixed habitats (13.7 birds per acre) when dates of observation were strictly comparable.—John W. Aldrich.

THE BIRDS OF ROCKY MOUNTAIN NATIONAL PARK. By Fred Mallery Packard. Nature Association, Estes Park, Colorado, 1950: 5½ × 8½ in., iv + 81 pp., 12 figures, 1 map. Paper. 75¢.

Every year hundreds of bird students visit Rocky Mountain National Park. Packard's photo-offset booklet, the most attractive and complete booklet of any sort thus far published on the Park, will supply trained observers with necessary background material in the form of bird records. Though a more definitive list of species than any hitherto brought out for the region, it is admittedly incomplete in certain respects. The author calls special attention to the inadequacy of our knowledge concerning one highly interesting ornithological phenomenon —the upward movements of birds after midsummer.

The region covered is Rocky Mountain National Park plus the area around the town of Estes Park on the east and Grand Lake on the west, all in northern Colorado. This comprises over four hundred square miles of mountainous terrain, all above 7,000 feet elevation and ranging upward to over 14,000 feet. A sketch map, giving principal place-names but without indication of altitudes, is included, and there is a brief summary of altitudinal zonation of major plant communities; a comprehensive list of pertinent references; and an index to the common names of bird species discussed.

Brief descriptions and notes on seasonal and altitudinal ranges are given for 219 species and subspecies of birds, thirteen of which are included, according to the author's expressed belief, on questionable grounds. Twelve line drawings of birds by Roger Tory Peterson are primarily decorative. Neither they nor the descriptions are designed to aid the beginner in bird identification. The booklet is primarily for observers already familiar with the avifauna of the region in general. Used with an adequate identification manual it should be of great help to those wishing to list or study the birds of the park.—Gordon Alexander.

BERKSHIRE BIRDS. By Bartlett Hendricks. Massachusetts Audubon Society, Boston, 1950: 6 × 9 in., 57 pp., 15 drawings, 6 maps. Paper. 60¢.

This 57-page check-list of Berkshire County birds is essentially a reprint, in convenient booklet form, of a series of articles which appeared recently in ten numbers of *The Bulletin of the Massachusetts Audubon Society* (Vol. 32–34, 1948–50). Aside from a field list published by the Berkshire Museum in 1941, it is the first full account of Berkshire birds since Faxon's and Hoffmann's "Birds of Berkshire County," published in 1900. The fact that the new check-list gives 271 forms compared to 197 in the earlier book is ample evidence of the growth of ornithological interest in the county in the past fifty years.

A 14-page introductory section includes such matters as topography and migration routes, the county's ornithological history, a section on bird identification (which might well have been condensed or perhaps omitted altogether), and helpful preliminary lists (of permanent residents, transients, etc.). Then follows the main list—the common name (without the scientific name) of the bird, each with a letter symbol (A to E) designed to indicate its frequency of occurrence, a graph by months (an ingenious invention of the author) which shows

the duration of stay of the bird in the county, and a summarizing statement or two concerning the known status of each, with instances of occurrence and authorities for the rarer species.

The records are based almost entirely on sight identifications. There is no collection of scientific bird skins in the county and there has been little or no deliberate collecting there for many years. For the most part the author, who for more than a decade has been the spirited leader of a corps of enthusiastic observers, has used good judgment in evaluating the records, but there can be no doubt that many of the sight records are open to question. Of 26 accidental visitors listed, apparently only four are supported by specimens.

The booklet is attractively and artistically illustrated with six maps and 15 black and white drawings of birds by Robert F. Seibert. The bird names used do not always conform to those of the American Ornithologists' Union Check-List (*Canvas-back* and *Buffle-head* are not hyphenated, the apostrophe and *s* are dropped from *Wilson's Phalarope* on page 29, and *Red-winged Blackbird*, perhaps consciously, is used for *Red-wing*). In two cases, at least, plural verbs are used with singular subjects. There appear to be some inconsistencies in the listings. For instance, 21 permanent residents are listed on page 10, but only 20 in the summary on page 13; 86 migrants are listed, but 87 are counted in the summary. The Hoary Redpoll and Clay-colored Sparrow are listed as winter and accidental visitors respectively, but omitted from the text, the only two out of 40 to be so slighted. Of the two extinct species listed, the Passenger Pigeon is accounted for in the text but the Heath Hen is not.

In spite of the skepticism that may well attach to a check-list making such extensive use of sight records, this booklet should prove a helpful guide to the many New Englanders, as well as outsiders, who go birding in the Berkshires.—George J. Wallace.

How to Choose and Use Field-Glasses. By E. M. Nicholson. British Trust for Ornithology, Field Guide Number Two, The Potter Press, Oxford, 1950: $8\frac{7}{16} \times 5\frac{1}{2}$ in., 8 pp. (unnumbered). Ninepence.

In this pamphlet the British Trust for Ornithology presents a complete guide on the use and care of field glasses and telescopes for ornithological work. Magnification, field of view, light-gathering power, weight and general design are discussed in relation to specific purposes for which the glasses are to be used. Simple tests are given for determining the quality of a glass.

Though not in wide use, a telescope is indispensable for certain types of bird watching. Mr. Nicholson comments that "Telescopes, in contrast to binoculars, have seen no fundamental improvement in external design since the time of Gilbert White, although coated models are now available. It is evident to anyone who glances at a party of ornithologists trying to use telescopes on a mud-flat that sooner or later either the telescope or the bird-watcher will have to be entirely redesigned." He adds, encouragingly, that a distinct improvement over the traditional telescope has been made in a new type of mirror telescope recently invented in Holland.

Ornithologists contemplating the purchase of new field glasses will do well to obtain a copy of this pamphlet by writing the Secretary, British Trust for Ornithology, 91 Banbury Road Oxford, England.—Andrew J. Berger.

COMPLEXITIES OF MIGRATION: A REVIEW
With Original Data from Arizona

BY ALLAN R. PHILLIPS

The ancient riddle of bird migration continues to fascinate and baffle ornithologists. New techniques—cooperative color-banding, telescopic observations, artificial transportation of marked birds, and the use of airplanes, radar, and automatic recording devices—have come to supplement the time-honored ones, yet the riddle remains unsolved. Birds show every conceivable sort of migration behavior. Some—for example certain American quail—appear to be strictly non-migratory or resident. Others—notably the Arctic Tern (*Sterna paradisaea*), certain Golden Plovers of the genus *Pluvialis*, the Wilson's Petrel (*Oceanites oceanicus*), and the two remarkable cuckoos, *Chalcites l. lucidus* (Fell, 1947) and *"Urodynamis" taitensis*, which breed in New Zealand and winter on remote islands in the vast Pacific Ocean—are famous for their long-distance migrations. The continued and widespread interest in bird migration is reflected in the reprinting, with some revision, of the excellent short survey of the subject by Thomson (1949).

A growing body of evidence indicates that some long migrations are performed in a few long flights or even in a single flight. This is true mainly of water birds (notably certain geese and shorebirds), but also of some Old World landbirds such as the Needle-tailed Swift (*Hirundapus c. caudacutus*), Red-backed Shrike (*Lanius collurio*), and Black-headed Bunting (*Emberiza melanocephala*) (Stresemann, 1944a, 1944b). Among North American birds not commonly recorded between their breeding and winter ranges, and therefore possibly non-stop migrants, are the Western Grebe (*Aechmophorus occidentalis*), Black Swift (*"Nephoecetes" niger*), Purple Martin (*Progne subis*), Gray Vireo (*Vireo vicinior*), and House Wren (*Troglodytes aëdon*). We have a very great deal to learn about migration. Such birds as most geese of the genus *Chen*; the two small forms of *Branta—minima* and *hutchinsii*; the Whooping Crane (*Grus americana*); and the Kirtland's Warbler (*Dendroica kirtlandii*) are known or believed to have very restricted breeding ranges, yet the migrations of even these forms will not be understood without long and intensive study.

For some years, and primarily from the standpoint of season and taxonomy, I have been much interested in the migrations of birds in Arizona and other inland parts of our Southwest. My studies indicate that some of the older theories of migration, advanced to explain limited data then available, must be carefully reviewed before they achieve the status of dogma. In this paper I purpose to describe some of these migrations in the Southwest and to discuss their relation to bird migration in general.

Regularity of Migration

The most impressive aspect of present-day bird migration is, of course, its regularity in time and space. Many birds are astonishingly regular in their seasonal comings and goings. But it is not correct to think of waxwings and certain boreal finches and birds of prey as the only irregular migrants. In southern Arizona, the movements of various thrushes, some fringillids—notably the Lawrence's Goldfinch (*Spinus lawrencei*)—some corvids, the Lewis Woodpecker (*Asyndesmus lewis*), the Thick-billed Parrot (*Rhynchopsitta pachyrhyncha*), and probably some sandpipers and the Sprague's Pipit (*Anthus spraguei*), are very erratic. Furthermore, banded individuals of supposedly rather regular species of owls and ducks have made long journeys in quite unexpected directions.

Except for species such as those just mentioned, and others which are extending their ranges, most small birds are extremely regular in their migrations, not varying greatly from year to year in date, route, or abundance. In the Southwest this is true of cuckoos, goatsuckers, swifts, hummingbirds, woodpeckers, and most perching birds. Physiologists now agree that the urge to migrate (*"Zugdisposition"*) originates most probably in the cycle of activity of the anterior

lobe of the pituitary gland (see the recent summary by Farner, 1950). This must be a very precise cycle, though the actual migration may be stimulated by weather patterns, as reviewed in a recent issue of *The Wilson Bulletin* (Bagg *et al.*, 1950). The general regularity of migration extends even to such peculiar cases of partial migration as those reported for smaller British birds (Lack, 1943–1944); to birds rather sedentary in some northern parts of their ranges but strongly migratory in other northern parts, e.g., the Turkey Vulture (*Cathartes aura*), Brown Creeper (*Certhia familiaris*), Mockingbird (*Mimus polyglottos*), and Golden-crowned Kinglet (*Regulus regulus*); to birds in which migration varies, in time or extent, with age and sex, e.g., certain shorebirds, the Costa's Hummingbird (*Calypte costae*), Yellow-headed Blackbird (*X. xanthocephalus*), and Western Tanager (*Piranga ludoviciana*); and to birds which migrate in different ways—in flocks, family groups, or singly; by day or by night; feeding or fasting as they go.

Complications are shown by the hummingbirds of Arizona. Not only does each species occur in a particular season and range, but within the species the season of occurrence of adult males is often different from that of females and young. The route in spring may be different from, or more restricted than, that in fall. Deelder (1949) found that female Scandinavian Chaffinches (*Fringilla c. coelebs*) migrated earlier, farther, and by a different route from, the males. How can such complexities be explained on a simple basis of temperature, food supply, or photoperiodicity?

Historical and Ecological Basis for Migration

Evidence of the historical and ecological basis of some migrations is the similarity of pattern among unrelated species. In North America several short-distance migrants from the north make their southernmost penetration in the Great Plains and Rocky Mountain regions, and fall off in numbers and extent toward both coasts southwardly. Such birds include the Rough-legged Hawk (*Buteo lagopus*); the larger races of Horned Lark, *Eremophila a. alpestris*, *E. a. hoyti*, and *E. a. arcticola*; the Northern Shrike (*Lanius excubitor*); Tree Sparrow (*Spizella arborea*); Lapland Longspur (*Calcarius lapponicus*); and Snow Bunting (*Plectrophenax nivalis*). In this same area, migration away from lowland breeding grounds tends to be the rule—particularly among ground-feeding birds like the Turkey Vulture, Mourning Dove (*Zenaidura macroura*), Mockingbird, Loggerhead Shrike (*Lanius ludovicianus*), Cowbird (*Molothrus ater*), and Rufous-crowned, Field, and Song Sparrows (*Aimophila ruficeps*, *Spizella pusilla*, and *Melospiza melodia*). Correlations between migration, winter temperatures, and the depth and duration of snow-cover[1] may be seen here. On the other hand, certain tree-feeding boreal birds show considerably less tendency to migrate in the mountains of this same region than they do farther east. Red-breasted Nuthatches (*Sitta canadensis*), Brown Creepers, Winter Wrens (*Troglodytes troglodytes*), Golden-crowned Kinglets, and even jays and chickadees seem to be less migratory here than along the Atlantic seaboard.

Variation in Time of Migration Within the Species

Discussions of the migration of certain species often suffer from indiscriminate lumping of individuals and races. This can easily produce false impressions. For example, the Yellow Warbler (*Dendroica petechia*) arrives in extreme southern Arizona by mid-March, in northeastern Arizona in late April, and in Canada and Alaska in May and early June. It would, therefore, be perfectly logical to assume that these birds move northward in the manner suggested by the old theory. The theory was that migration paralleled the advance of isotherms in the spring: that the birds moved northward very slowly at first, but more rapidly each day, in keeping with the increasing tempo of the advance of spring over the continent. In this way,

[1] Snow-cover as an ecological factor has been little discussed in North America, though there is an extensive Russian literature concerning it (Formosov, 1946).

each bird was alleged to arrive on its breeding grounds, by convenient flights, just when it was ready to breed (Griscom, 1945: 92, 108). Unfortunately for this attractive theory, all March and early April Yellow Warbler specimens from Arizona are of the bright-colored southwestern race, *sonorana*, which arrives and establishes territories here long before it is ready to breed; the more northern races do not normally reach Sonora and the southwestern United States before rather late April; while the dull far northern race, *rubiginosa*, does not ordinarily enter the United States until May. This form has been taken in extreme southern Sonora as late as June 8 and 30! While it is dangerous to argue from analogy, do not these known facts about the Yellow Warbler suggest that Red-eyed Vireos (*Vireo olivaceus*) which reach the Florida Keys in early May (when the Red-eyed Vireos of the southern United States are already beginning to nest) are individuals bound for points along the northern frontier of the species' range?[2]

An example of the complexity of fall migration is provided by the Hermit Thrush (*Hylocichla guttata*). In the mountains of southern and central Arizona the large race *auduboni* nests in the fir and spruce forests of the boreal life-zones. It is joined in mid-September by migrants of the same and other southern races; during early October these range widely in the mountains and appear uncommonly in the lowlands. Practically all, both breeding race and migrants, leave for the south by late October, when they are rapidly replaced by Alaskan birds (of the nominate race). The Alaskan birds winter here at a little lower altitude (mainly in Upper Sonoran Zone chaparral) than the breeding areas of *auduboni*, which has now retired to the highlands of México and Guatemala. Thanks to the well marked and readily identifiable subspecific characters of these birds, an apparently vertical migration has been shown, by careful collecting and identification, to be actually a composite of different latitudinal migrations! Nearly all "vertical migrations" in the northern hemisphere can be equally well regarded as short southward migrations; few if any birds descend to the lowlands on the *north* side of their mountain homes in the fall. Individuals may wander in that direction, however, as seems to be indicated by the Steller's Jay (*Cyanocitta stelleri*) reported by Hough (1949).

Alleged up-mountain movements in late summer and "midsummer wandering" should be further investigated. Most birds concerned are either southbound transients or breeding birds present before the arrival of human observers. Fledged young seeking territories move about, of course, to some extent; and this may be the explanation of the Canyon Wrens (*Catherpes mexicanus*) reported by Packard (1946: 157) from high in the mountains of Colorado "in summer and autumn." [3] What is more significant, it seems to me, is that Packard does *not* list any high-altitude records of such birds as the Scrub or Woodhouse's Jay (*"Aphelocoma" coerulescens*), Mockingbird, Virginia's Warbler (*Vermivora virginiae*), Arkansas Goldfinch (*Spinus psaltria*), or Cassin's Sparrow (*Aimophila cassini*), which are near the northern limits of their ranges in this region, nor of the several sagebrush, juniper, and piñon-inhabiting species to the west. In late August and September, Marsh Hawks (*Circus cyaneus*), Sparrow Hawks (*Falco sparverius*), Mourning Doves, Arkansas Kingbirds (*Tyrannus verticalis*) and Lark Sparrows (*Chondestes grammacus*) are to be seen in virtually all unforested high parts of the western United States. Have these species moved up the mountains from their breeding grounds? Probably not. Probably they are performing a normal north-to-south migration.

The "Flyways" Concept

The three main zoogeographic divisions of the United States are bounded by the Great

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[2] Svärdson (1947) reported that in 1946 the spring migration of the Wood Warbler (*Phylloscopus sibilatrix*) through Denmark and Sweden proceeded independently of isotherms. One hundred observers collaborated in the study.—Editors.

[3] This wren, however, apparently forages up and down steep hillsides for hundreds if not thousands of feet in the course of a day. and the actual distance from occupied territory is not mentioned.

Plains (at about the 100th meridian) and by the Sierra Nevada-Cascade Mountain axis. Yet even these major regions hardly deserve to be called migration "flyways". Such a term might imply, to the uninitiated, that migratory birds are found only along certain rather narrow lines. Actually, of course, migration is almost universal, though it is less conspicuous in some tropical islands, and in humid areas such as Pacific northwestern North America, than in most mid-continental areas. Concentrations of migrants do follow coast-lines, to be sure, and some species utilize thermal air-currents above hills and mountains. Waterfowl and swallows tend to follow rivers flowing north to south or south to north across arid regions. But the same species occur over wide areas away from these lines, also. Ducks are known to cross quite normally from one "flyway" to another (Aldrich *et al.*, 1949). Many North American fringillids and other land-birds do not even stay within the same major zoogeographic division while migrating. Examples include hummingbirds, thrushes, warblers, and perhaps even some such partial migrants as the Ground Dove (*Columbigallina passerina*) and Vermilion Flycatcher (*Pyrocephalus rubinus*). Ignoring our "flyways", the Catbirds (*Dumetella carolinensis*), Veeries (*Hylocichla fuscescens*), Red-eyed Vireos, and Bobolinks (*Dolichonyx oryzivorus*) of the Rocky Mountain-Great Basin region retrace the route by which, presumably, they entered that area. So do the many eastern birds now nesting in Alaska and northern British Columbia, and the Old World forms now nesting in Alaska and Greenland. Such criss-crossing of constant, regular routes at definite seasons shows the innate character of migration.

Accuracy in Orientation and Navigation

The accuracy of this innate control is remarkable. Although the vast Pacific Ocean is neither absolutely uniform nor wholly without landmarks (Preston, 1949), the annual visits of shorebirds to remote atolls southward as far as New Zealand are still amazing. Without precise orientation surely these birds would have been exterminated long since. Of special interest in this connection is the Townsend's Warbler (*Dendroica townsendi*), which has two winter ranges, separated by hundreds of miles. Some winter along the California coast from Pasadena northward to San Francisco Bay, while the rest apparently winter from central and northeastern México (Nuevo León) to El Salvador, and the species is purely casual in the extensive region intervening. The winter range of the Alaska Myrtle Warbler (*Dendroica coronata hooveri*) is similarly divided, but stragglers have been reported from the intervening territory more frequently.

A migrating bird may, after getting its bearings, continue by using visual clues; its sense of direction may function only at certain times. Thorpe (1949) divides the flight into its start, body, and termination, and points out that each part presents a separate problem. Suggested means of possible orientation are magnetic receptors (Yeagley, 1947), sensitivity to the earth's rotation (Ising, 1945), winds and air pressure patterns, and the directions of sunrise, sunset, the heavenly bodies, etc. None of these has met with general acceptance, but each may prove of some value to certain birds. We must be cautious lest we reject a theory merely because differences to be detected in stimuli are minute. Differences in time and force of sound-waves received by our two ears are also very small, yet almost without exception we instantly know the direction whence the waves have come.

At least one migratory bird, the Black-chinned Hummingbird (*Archilochus alexandri*), evidently possesses a remarkably accurate memory of the location of spots visited only once previously (Bené, 1945: 21). Visual orientation is apparently important during migration as well. In the northeastern United States, where visibility is generally limited, migrants often fly low. They can be heard calling overhead even on clear nights and they often collide with man-made obstacles of no very great height. In the clear air of Arizona, on the other hand, migrants are seldom if ever heard. This silence is not due to lack of birds. There are more species of land birds migrating in the Santa Cruz River region of southern Arizona during an average year than in more publicized areas like New York City; and only slightly fewer of

them are song-birds, which are the birds we usually hear calling as they fly overhead. The difference in proportion of song-birds is due to the relatively few species of warblers and *Hylocichla* thrushes in the west. Geyr von Schweppenburg (1949) has noted a similar silence in the Sahara Desert. This can be correlated with the range of vision in arid regions. From one western Arizona mountain it is easy to see, at dawn, mountains to the east as far distant as 135 miles, while mountains 100 miles away are usually visible all day in clear weather. Thorpe (1949) questions whether significant migrations ever occur on heavily overcast nights. Use of the eyes does not necessarily imply, however, that migrants simply see a route and learn it. Some evidence from banded birds in Europe indicates that even regular migrants may follow different routes in succeeding years (Drost, 1941).

Relation to Molt and the Sexual Cycle

The directness of the apparent correlations between migration, molt, and the sexual cycle seems doubtful. Studies of molt in relation to autumn nesting are desirable. There are genera, such as *Empidonax* and *Phylloscopus*, in which some species complete their molt before fall migration while other species, closely related, do not. In late April and May, some male warblers and sparrows taken in Arizona, hundreds of miles south of their breeding ranges, have fully developed testes; were they not fat, one would suppose they were breeding birds. Van Rossem (1945) contends that a Yellow-green Vireo, *Vireo olivaceus hypoleucus*, migrates in breeding condition through the breeding range of another race, *V. o. flavoviridis*, in Central America. Dickey and van Rossem (1938) record eggs supposed to have been laid at an overnight roost of migrating hawks in El Salvador; if, as supposed, the birds were really Swainson's Hawks (*Buteo swainsoni*), they were still well over a thousand miles south of their breeding range. McIlhenny (1932: 294) reports eggs dropped by Blue Geese (*Chen caerulescens*) just before their departure from Louisiana for the Arctic. Certain eggs found in northern Arizona do not appear to be those of any species normally nesting in the region. We know all too little about "dropped" eggs. Attention is called, too, to the fervent singing and prolonged maximum in gonad-size among Cassin's Sparrows in a region throughout which they are not known to breed (Phillips, 1944).

Various workers have recently challenged the familiar axiom that no bird ever breeds twice during the same year in different regions. It would of course require extraordinary luck and persistence, or both, to prove this. Wagner (1948) believes that Broad-tailed Hummingbirds (*Selasphorus platycercus*) which nest in the vicinity of Mexico City in autumn are the same ones that have already nested, earlier in the summer, in the Rocky Mountains of the United States. Some Arizona ornithologists have noted a post-breeding disappearance, probably a migration, from the low, hot valleys of southwestern Arizona of such birds as the Costa's Hummingbird, Say's Phoebe (*Sayornis saya*), Phainopepla (*Phainopepla nitens*), and Loggerhead Shrike. Of these, the Phainopepla is the most likely to raise a second brood elsewhere; but all are worthy of careful investigation. The casual breeding of European White Storks (*Ciconia ciconia*) in South Africa has been recorded, but this must certainly be exceptional.

Effect of Short-term Weather Influences

Accidents which happen on migration, sometimes as a result of meteorological irregularities, occasionally resolve themselves into natural experiments that may yield important clues. At the Nashville ceilometer Spofford (1949) saw birds kill themselves by flying straight into the ground when a beam of light struck them. Bishop (1949) noted the same behavior among petrels. Many of the circumstances were, of course, widely different in these two cases, and the cause is obscure in both. The great trans-Atlantic flight of Lapwings in December, 1927 (Witherby, 1928), was evidently caused by exceptional winds combined perhaps with poor visibility. But wind and rain are perfectly normal; very few storms produce remarkable flights; and an attempt to explain unusual occurrences on such a basis (Williams, 1950) may

produce conclusions which are at variance with known facts of bird distribution and migration, even if no errors of identification are involved among the "records" so explained. Weather variations have been much discussed recently by Williams (1950 and elsewhere), Bagg *et al.* (1950), Robbins (1949), Vleugel (1948), and others. Except in winter, their role is apparently merely regulatory. Seldom are migrating birds the passive playthings of the elements!

Landmarks vs. Sense of Direction

The writer does not share the optimistic opinion expressed by Griffin and Hock (1949) that many migration phenomena are explicable in terms of exploration for landmarks. Buss's observations (1946) indicate otherwise; and if Golden Plovers leaving the Bering Sea are apt to fly in *any* direction, how can we account for the extreme rarity of the entire genus in that intensively studied region to the south—the west coast of the United States, with its extensive shoreline? The Bristle-thighed Curlew (*Numenius tahitiensis*) apparently maintains an even more rigid course across the Pacific Ocean. This does not argue inefficient navigation. Neither do the observations of F. W. Loetscher, Jr., and myself on San Francisco Mountain, the highest mountain in Arizona, on July 28, 1939. There, not far below timberline, in the Inner Basin, Audubon's Warbler (*Dendroica auduboni*) is the only breeding *Dendroica*; yet during our visit we collected two of three to five Black-throated Gray Warblers (*D. nigrescens*) seen, three Hermit Warblers (*D. occidentalis*), and three Townsend's Warblers of four or five seen. The date is about the beginning of the warbler migration, especially for the last two species, which were already hundreds of miles south (or east) of their breeding grounds. An even earlier Hermit Warbler had been taken ten days before in the Santa Rita Mountains, still farther south. The important point is that every warbler observed on July 28 (as well as the Hermit Warbler taken July 18) was an immature. Within two months of hatching, these young birds had flown unerringly and unguided to the points of autumn concentration of their species! San Francisco Mountain is surrounded by a great plateau, an area superficially similar to the mountain itself, though less high of course. The forest covering the Mogollon Plateau is said to be the largest forest of yellow pine (*Pinus ponderosa*) in existence. It extends eastward as far as, and into, New Mexico. But though much more field work has been done here on the plateau, near Flagstaff, than on the mountain above, neither the Townsend's nor the Hermit Warbler has ever been found at Flagstaff before August 2, and no Townsend's before August 25. Both species are commonest in the highest forests available.

Verwey (1949) concludes that not only birds, but also fishes and aquatic mammals, have in some cases a sense of direction.

Conclusion

Is it not likely that, among the many migrations known to take place today, different kinds have arisen at different times and places, in response to different sets of conditions during geologic time? If so, how can any one set of simple theories cover all the facts? Dangerous as it may be to formulate general hypotheses on the basis of local data, we cannot ignore data simply because they do not fit widely accepted hypotheses. To be useful, a hypothesis should be flexible enough to account for quantities of local data without forcing facts to fit theories.

Migration remains a mystery, and it seems unlikely that any one simple explanation will cover any very large percentage of the known facts. The latter become stranger and stranger; readers of *The Wilson Bulletin* will recall Broley's (1947: 3–6) discovery that the Bald Eagle (*Haliaeetus leucocephalus*) is absent from Florida "during July and August." In conclusion, quoting Thomson: "What, in particular, guides the young birds in those cases where they travel apart from their parents when only a few weeks old, and yet perform a long journey in accordance with the constant pattern of their species? Therein lies the real mystery of migration."

Literature Cited

Aldrich, John W., *et al.*

1949 Migration of some North American waterfowl. U.S.D.I., Fish & Wildl. Serv., Spec. Sci. Rep. (Wildl.) No. 1.

Bagg, A. M., *et al.*

1950 Barometric pressure patterns and spring bird migration. *Wilson Bulletin*, 62: 5–19.

Bené, Frank

1945 The role of learning in the feeding behavior of Black-chinned Hummingbirds. *Condor*, 47: 3–22.

Bishop, Louis B.

1949 Catching petrels by flashlight. *Condor*, 51: 272.

Broley, Charles L.

1947 Migration and nesting of Florida Bald Eagles. *Wilson Bulletin*, 59: 3–20.

Buss, Irven O.

1946 Bird detection by radar. *Auk*, 63: 315–318.

Deelder, C. L.

1949 On the autumn migration of the Scandinavian Chaffinch (*Fringilla c. coelebs* L.). *Ardea*, 37: 1–88.

Dickey, Donald R., and A. J. van Rossem

1938 The birds of El Salvador. Field Mus. Nat. Hist. Zool. Ser., 23.

Drost, Rudolph

1941 Zieht der einzelne Vogel stets auf demselben Weg? *Ardea*, 30: 215–223.

Farner, Donald S.

1950 The annual stimulus for migration. *Condor*, 52: 104–122.

Fell, H. Barraclough

1947 The migration of the New Zealand Bronze Cuckoo, *Chalcites lucidus lucidus* (Gmelin). *Trans. Roy. Soc. N. Z.*, 76: 504–515.

Formosov, A. N.

1946 Snezhnyi pokrov v zhizni mlekopitaiushchick i ptits, SSSR. Materiali k poznaniiu Fauny i Flory SSSR, izdavaemye Mosk. Obshchestvom Ispytatelei Prirodi, n.s., *Otdel Zool. Vypusk*, 5 (20).

Geyr von Schweppenburg, H.

1949 Zuggeselligkeit. "Ornithologie als biologische Wissenschaft" (Stresemann Festschrift), 261–268. Carl Winter, Heidelberg.

Griffin, Donald R., and Raymond J. Hock

1949 Airplane observations of homing birds. *Ecology*, 30: 176–198.

Griscom, Ludlow

1945 Modern bird study. Harvard University Press, Cambridge, Mass.

Hough, John N.

1949 Steller Jay flies south in the spring. *Condor*, 51: 188–189.

Ising, Gustaf

1945 Die physikalische Möglichkeit eines tierischen Orientierungssinnes auf Basis der Erdrotation. Arckiv för Matematik, Astronomi och Fysik, 32A (18).

Lack, David

1943–4 The problem of partial migration. *Brit. Birds*, 37: 122–130, 143–150.

McIlhenny, E. A.

1932 The Blue Goose in its winter home. *Auk*, 49: 279–306.

Packard, Fred M.

1946 Midsummer wandering of certain Rocky Mountain birds. *Auk*, 63: 152–158.

PHILLIPS, ALLAN R.
1944 Status of Cassin's Sparrow in Arizona. *Auk*, 61: 409–412.
PRESTON, F. W.
1949 The Pacific flyway of the Golden Plover. *Auk*, 66: 87–88.
ROBBINS, CHANDLER S.
1949 Weather and bird migration. *Wood Thrush*, 4: 130–144.
SPOFFORD, WALTER R.
1949 Mortality of birds at the ceilometer of the Nashville airport. *Wilson Bulletin*, 61: 86–90.
STRESEMANN, ERWIN
1944a; b Der zeitliche Ablauf des Frühjahrszuges beim Neuntöter (*Lanius collurio*); beim Kappenammer *Emberiza melanocephala* Scop. *Orn. Monatsberichte*, 52: 1–10 and 85–92.
SVÄRDSON, GUNNAR
1947 Grönsangårens (*Phylloscopus sibilatrix* Bechst.) vårflyttning över Danmark och Skandinavien. Vår Fågelvärld, 6: 1–28.
THOMSON, A. LANDSBOROUGH
1949 Bird migration. H. F. and G. Witherby, Ltd., London.
THORPE, W. H.
1949 Recent biological evidence for the methods of bird orientation. *Proc. Linn. Soc. London*, 160: 85–94.
VAN ROSSEM, A. J.
1945 A distributional survey of the birds of Sonora, México. *La. State Univ. Mus. Zool. Occ. Papers* No. 21.
VERWEY, J.
1949 Migration in birds and fishes. *Bijdragen tot de Dierkunde*, 28: 477–503.
VLEUGEL, D. A.
1948 Enkele waarnemingen over "vorstvlucht" en "randtrek" in het Sloe-Schengengebied tijdens de winters van 1935/1936 en 1936/1937. *Ardea*, 36: 143–162.
WAGNER, H. O.
1948 Die Balz des Kolibris *Selasphorus platycercus*. *Zool. Jahrbücher*, 77: 267–278.
WILLIAMS, GEORGE G.
1950 Weather and spring migration. *Auk*, 67: 52–65.
WITHERBY, H. F.
1928 [Discussion of unusual flights of the Lapwing, *Vanellus vanellus*] *Brit. Birds*, 21: 215–216; 22: 6–13, 43, 68–69.
YEAGLEY, HENRY J.
1947 A preliminary study of a physical basis of bird navigation. *Jour. Applied Physics*, 18: 1035–1063.

MUSEUM OF NORTHERN ARIZONA, FLAGSTAFF

NEW LIFE MEMBER

Burt L. Monroe, Sr., of Anchorage, Kentucky, has served our Club in so many ways that it is natural to think of him as one of our most important members. He will long be remembered for the thought and devotion he gave the treasurership from 1946 to 1950. He was Chairman of the Membership Committee for a time and also an elective member of Council. Now our Second Vice-President, he is also our official representative on the Council of the American Ornithologists' Union.

Among the most active of Ohio Valley ornithologists, not only has he published many papers on birds of the region, but he has gone out of his way in encouraging others to watch birds and report on their findings. He has been president of, and editor and curator for, the Kentucky Ornithological Society. He helped to develop the large and progressive League of Kentucky Sportsmen, of which he was president for a time. As State Ornithologist, a post he has held many years, he advises the Kentucky Division of Game and Fish, and has had much to do with bringing about that organization's present stature and power. He is an editor

of the Division's magazine. He writes a column on conservation for *The Louisville Courier-Journal*.

His reputation as a genial companion and spinner of yarns almost rivals his reputation as an ornithologist. How he manages to do his daily stint as planning engineer and assistant secretary of the Commonwealth Life Insurance Company no one knows—but he does.

THE PERSECUTION OF PREDACEOUS BIRDS

Of real concern to ornithologists today should be the wanton destruction of non-game species. Although many naturalists condemn all hunting, it is clear that a great many outstanding, influential conservationists have also been avid hunters. As Aldo Leopold wrote, "that we who love geese should also love to hunt them is a paradox which puzzles logicians." Hunting as practiced on a wide scale is to be condoned if the shooter is governed by self-restraint and does not indulge in careless waste of wildlife; but not all shooting is of this type and for that reason laws and enforcement officers are necessary not only to cope with the myriad problems arising from the intense competition for the supply of wild game, but also to protect species not labelled *game*.

These laws are not uniformly enforced or enforceable. In some states hawks, owls, and fish-eating birds are shot and pole-trapped with complete disregard for law. Fox and wolf drives result in mass extermination of anything that moves. Pest control campaigns and bounty payments continue contrary to biological justification. These problems are only part of the bigger one—a disregard for the value of wildlife not considered game.

This disregard is exemplified, first, by the hunter who shoots all hawks and owls in the belief that he is protecting quail and rabbits. Selfish in his desire to increase meat for his game pocket, he is willing to barter the bare existence of one species for the anticipated increase of another, quite ignorant of the essential role all may play.

Secondly, there is the shooter in search of any live targets to lay his long-range rifle on. In recent years "souped-up" varmint rifles have become the special toy of a certain class of shooters. These rifles, delivering up to 4200 feet per second muzzle velocity, equipped with high power scopes, and otherwise designed for shooting from a rest, are ideal for those who like to find targets and destroy them from the comfort of an automobile. Unsuspicious perching hawks and other "varmints" are completely at the mercy of such shooters whose range of accuracy is up to 200 yards. When approached about the matter of hawk shooting, a few "varminter" men righteously aver that they shoot only crows and cats, or only bird hawks, but some blithely admit, "I just want to see what this gun will do."

The lack of facts and esthetics characteristic of the above two types is clearly the result of continuous propaganda by the hunting and fishing magazines. These magazines, replete with "true" stories, letters from oldtimers who "know," and the colorful broadsides of arms and ammunition manufacturers, clamor for the destruction of various non-game species—crows, magpies, jays, horned owls, goshawks, sharp-shins, and even duck hawks, plus mammals of many kinds. Thus, species which many of us like to see and watch and claim as a rightful part of our heritage are labelled by sporting magazines as vermin, and even some state conservation agencies take this attitude.

But the shooter is not the only evil—there are several worms in a bad apple. Pest hunts usually originate with good intentions. In some areas rabbits, ground squirrels, starlings, blackbirds, etc. become too abundant, causing some sort of damage. However, campaigns enlisting children under the guise of good conservation, and often sponsored by vocational agricultural leaders, county agents, and conservation officers, expose the impressionable mind of youth to the false precept that organized slaughter with "point" rewards is the answer to pest problems. This is not only a bad attempt at conservation but poor esthetics as well, and will never foster a generation of conservators of wildlife.

The conservation officer represents the state and is regarded by the public as the local authority on wildlife matters. From our experience in several states, however, the attitude of these officers toward raptors and other predators is often not in keeping with biological facts or even the laws. The public acceptance and support of laws for wildlife conservation will be no more sincere than official attitude.

Another worm in the apple is the control measures conducted around game farms and fish hatcheries. Hawks and owls lured in by easy hunting are promptly dispatched at state as well as private game farms. Fish predators likewise are summarily disposed of at hatcheries. One fish hatchery is known to pay a bounty to employees for kingfishers and herons shot. The merit of artificial rearing itself is questionable, but as long as we have the system we shall probably have its undesirable details. Should we tilt at "pole-trap windmills?"

Laws protecting hawks go unenforced in many states because it is claimed that conviction would be impossible. If so, a clear-cut need for better education at a civic level is apparent. Along the roads in Alberta the telephone poles are resplendent with hawks during the fall migration, yet few are shot for, as several farmers said, "Each hawk is worth $40.00 to the farmer." A grain farmer is in an excellent position to make this evaluation. Perhaps we could spread this simple idea more effectively.

The best way to get the teaching job done is to stimulate a public desire for the addition of conservation subjects to the lower grade curricula; but basic to this is the production of leaders. Leadership training should be available in conservation camps and normal schools to provide teachers who understand the correct use of natural resources, and who recognize the opportunities for improving the relationship between man and his environment.

State and local ornithological groups, while not usually blessed with surplus funds, could lend active support to leadership training programs through publicity in their own journals. Since the acceptance of new ideas in public education is slow at best, stop-gap measures are desirable. The publicity campaign is useful. Competent ornithologists in each state should consider a publicity campaign for the conservation of predaceous birds, particularly in those states where no *real* protection is given. Newspaper articles, radio programs, and booklets could be used to spread the word. Booklets should be free, attractive, and informative. Few such booklets are now available. Publications from Pennsylvania and Wyoming fit these specifications except that they are available for nominal prices which definitely limit distribution. A publicity program usually requires competent personnel with journalistic ability as well as financial support, but much could be done through the cooperation of interested organizations.

The education of the public is but one approach. What other chances are there for doing something positive for predaceous birds? In this era of cheap money, one wonders if there is not something to be garnered for the less-prized species. While non-game birds benefit considerably from the acquisition and development of refuge areas set aside annually with the use of Federal Aid funds, more than just a token acknowledgement is due this important segment of the bird fauna, particularly predatory species. Why not counter-balance the heavy subsidization of game investigations with some much needed research on non-game? There is danger of the present system nurturing the philosophy that conservation is *only* for game species. As Hochbaum put it, "the game manager or wildlife technician has built up a science of his own which breaks too far away from the fundamentals of biology upon which it was founded." Notwithstanding the fact that a large portion of the money comes from the sportsman's pocket, any activity that does not adhere to the principle of saving all the flora and all the fauna is not true conservation.

Nothing in the wording of the Pittman-Robertson Act indicates that Federal Aid money may not be used for the benefit of non-game species. Selection of projects appears to be a matter of choice with the states, and the emphasis upon game species was natural in the early

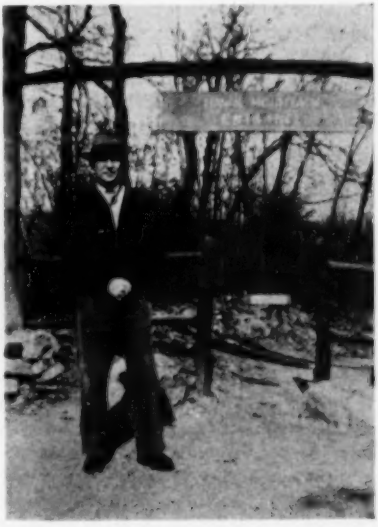
years of the assistance program. Despite expensive duplication of effort, states do carry on parallel research on quail, pheasants, grouse, waterfowl, deer, etc. A mountain of data is accumulated, publications are cluttered with details differing mainly in their place of origin, and the technical sessions of annual meetings still labor with the old topics. Perhaps it is now time to question whether some of the game research money being spent is really *well* spent. Would it be better spent if applied to a less intensively cultivated field of wildlife investigation, namely, predaceous birds?

With the availability of Dingell-Johnson funds the relationship of fish-eating birds to the production of game fishes assumes greater importance. The facts are none too well known. On warm water impoundments, where underfishing and stunting are the major problems, perhaps we could find a means of soliciting the help of fish predators in removing the small, unharvestable fishes. It will be extremely disheartening if the persecution of fish-eating birds is to be permitted on the water areas created or maintained with Dingell-Johnson money.

Local support for strong protection programs by the various states means a strong national program. As the local attitude is bettered the state enforcement officer's task becomes more justifiable in the public mind. On a national scale this means an easier course in conserving and perpetuating species whose fame, if not distribution, transcends state boundaries, e.g., the California Condor and the Everglade Kite. Citizens of the western states no longer will wonder what is their stake in the future of the Everglade Kite, for an awareness of the inherent values of local fauna will align them with the group that seeks to help not only a bird but man himself.—CHARLES M. KIRKPATRICK AND WILLIAM H. ELDER.

NEW LIFE MEMBER

Paul J. Nowland was born in Wilmington, Delaware in 1895 and has maintained residence there all his life. He attended Princeton for two years. During the first World War he served overseas as a member of the aviation section of the U. S. Army Signal Corps. One beautiful moonlit night in 1918, near Romsey, England, he heard his first Nightingale (*Luscinia megarhyncha*) sing. He has long been an admirer of Alexander Wilson. His love for birds and desire to protect them has focussed recently upon the Hawk Mountain Sanctuary in Pennsylvania. Our photograph of Mr. Nowland shows him standing near the entrance to this famous sanctuary—the only one of its sort in America.



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The Wilson Bulletin is not as large as we want it to be. It will become larger as funds for publication increase. The Club loses money, and the size of the *Bulletin* is cut down accordingly, each time a member fails to pay dues and is put on the 'suspended list.' Postage is used in notifying the publisher of this suspension. More postage is used in notifying the member and urging him to pay his dues. When he does finally pay he must be reinstated on the mailing list and there is a publisher's charge for this service. The *Bulletin* will become larger if members will make a point of paying their dues promptly.

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